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DISEASES AND DISORDERS OF THE HEART

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ON

THE PRINCIPLES WHICH GOVERN

TREATMENT

IN

DISEASES AND DISORDERS

OF THE

HEART

THE LUMLEIAN LECTURES DELIVERED BEFORE THE ROYAL COLLEGE OF PHYSICIANS, LONDON

BY

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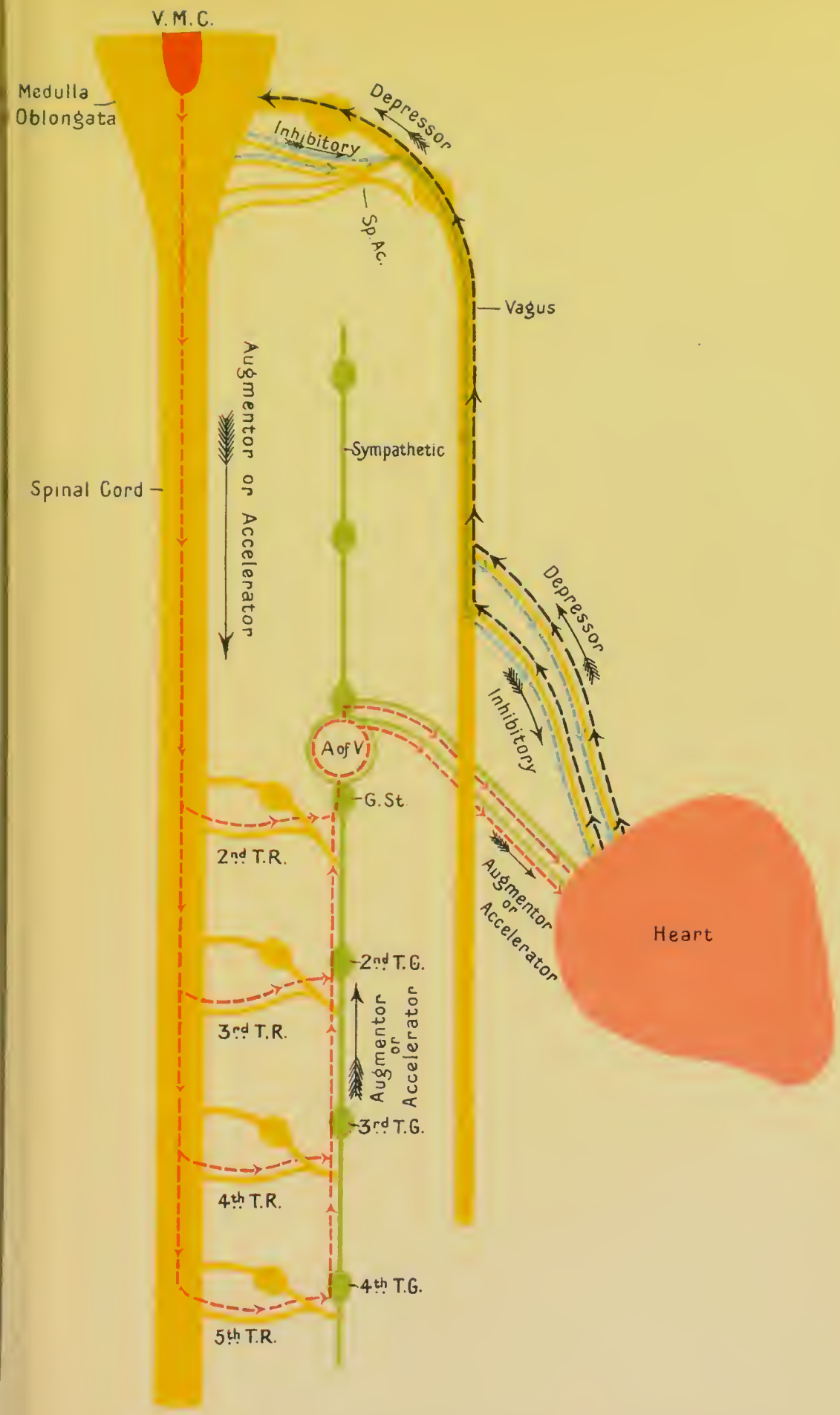

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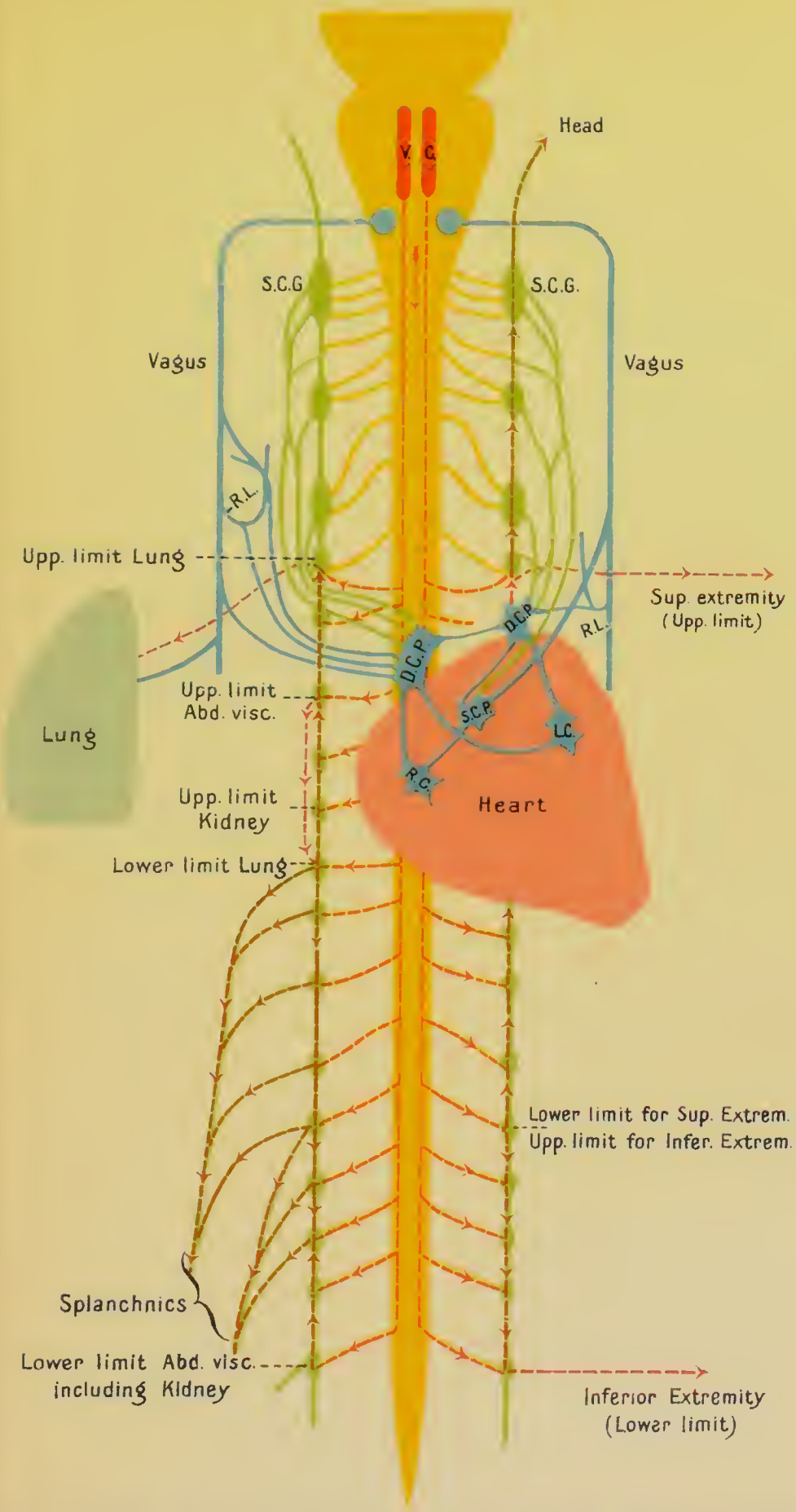


DIAGRAM OF THE INNERVATION OF THE HEART

THE

PRINCIPLES WHICH GOVERN TREATMENT

IN

DISEASES AND DISORDERS OF THE HEART.

LECTURE I.

Mr. President and Fellows,

It was in a rash moment that on being honoured by the request of the Council of the College that I should this year give the Lumleian Lectures I chose the subject of Heart Disease for my text.

It was something of the feeling expressed by the late Dr. Stokes* that heart diseases tend still to be regarded from too detached a point of view that led me to this selection. One may, for instance, still read of angina pectoris as a separate and fatal affection of the heart, instead of its being regarded as a painful incident of varied significance that may occur in the course of a wide range of functional and organic diseases of the cardio-vascular system.

Separate chapters must be devoted to describing the peculiarities of aortic, of mitral, of pericardial, of

* W. Stokes, "Diseases of the Heart and Aorta," Dublin, 1854.

trophic diseases of the heart, but the effectual grasp of their practical treatment is weakened unless they be gathered up again for review from more comprehensive standpoints. I have at least no other excuse for again dealing with a subject that has recently and so ably been brought before the College in almost every relation by our distinguished Fellows—Sir W. Broadbent,* Dr. Leech,† Dr. Lauder Brunton,‡ and Dr. Markham Skerritt§—and treated of in several able works which have recently appeared.

It is easier to find "books in the running brooks" and "sermons in stones" than to thread into a discourse, suggestive interesting and helpful, the current knowledge of a subject familiar to those to whose thoughts in their daily work it must be ever recurring.

It is, however, one of the functions of the Lumleian lecturer to attempt this, to review from the side of experience and clinical observation the net results of most recent researches and to endeavour to show how far they should influence us in our daily practice.

There is perhaps no branch of medicine in which, notwithstanding much knowledge, the confidence of the practitioner is so easily shaken and in which he is

* Sir W. Broadbent, "Prognosis in Structural Diseases of the Heart," Lumleian Lectures, 1891.

† Dr. J. Leech, "Croonian Lectures," *British Medical Journal*, 1893, vol. i., pp. 4, 56, 108, 169.

‡ Lauder Brunton, "Modern Developments of Harvey's Work," Harveian Oration, 1894.

§ Markham Skerritt, "Bradshaw Lecture," *British Medical Journal*, 1897, vol. ii., p. 1327.

so apt to relinquish the courage of his opinions as in heart diseases; and there is none in which the public, who treat their hearts with too much respect and their nervous system with too little, require such firm and steadfast guidance at the hands of our profession.

In my endeavour to lay down the lines of treatment of heart disorders and diseases I will first speak of such modifications of the cardiac functions as are the result of disturbed or even organically changed innervation of the heart and vessels, the heart itself being sound. Secondly, I must glance at similar disturbances of extrinsic sources as they affect an unsound heart. Thirdly, I will endeavour to group from a therapeutic point of view the intrinsic disablements and diseases of the heart mainly under the headings—(1) of heart failure in acute disease; (2) of cardiac overstrain; (3) of chronic heart failure; (4) of acute inflammatory cardiac affections; (5) of chronic valvular affections of the heart; and (6) of ulcerative diseases of the endocardium.

In order to understand so far as is at present possible functional diseases of the heart and to arrive at a point from which we may safely take further steps in their apprehension, we must have clearly traced in our minds the paths of direct and indirect cardiac innervation and the vaso-motor nerve mechanism.

I have with the kind help of my friend Dr. Risien Russell illustrated these two systems of nerve mechanism on separate charts, which show with precision our anatomical and physiological knowledge which has

been brought to its present degree of completion by the labours of Claud Bernard, Roy, Adami, Bradford, and others, but most especially of Gaskell. These diagrams will be quite sufficient without any further description from me to bring afresh to your minds the main points respecting the innervation of heart and vessels with which you are well acquainted, and will serve for reference at any time in the course of my remarks.

It is impossible to isolate the heart from the vessels when thinking of its functional disturbance; we must look upon the cardio-vascular system as a whole. Originally a mere branched contractile tube, it is now but a highly differentiated tubal apparatus with a nervous mechanism which has grown in complexity *pari passu* with the manifold interests of the circulation in the extended empire to which it has to minister.

With considerable accuracy the blood may be said to be held in the grasp of the cardio-vascular tubes; that the blood current is maintained and directed by the rhythmic pumping action of the two ventricles and by the position of the valves. The tendency is for the muscular arterial system to evacuate all the blood into the lax and capacious venous system, but the due proportion of blood distributed to the arteries and veins is secured by the controlling action of the small vessels which regulate the flow through the capillaries.

The heart and vessels are, indeed, an intricate mechanism, one part of which reacts upon another; each section of the circulation is influenced by the

needs of the organ or tissue which it serves and the whole is coördinated by the central nervous system to the control of which it is in every detail subservient. Whenever any commotion occurs of sufficient intensity beyond the common in any department of the circulation, our consciousness becomes aware of it, but it is of disturbances excited in the heart's doings, although they may be but central to a more widely ranging disorder, that our consciousness takes especial note.

There are unquestionably a large number, perhaps an increasing number, of people who are morbidly conscious of their heart's action, indeed of the function of their cardio-vascular system generally or in particular parts. They feel disturbances, flutterings at the heart, throbbings, flushings, pallors of the surface or noises in the vessels about the head, and apart from and in the intervals of these more definite sensations, they have a sense of their heart beating, and appreciate sometimes a disorder, an intermission, or a faintness in its action.

This condition, or group of conditions, and the thousand and one variations to which it is subject, is the result of a purely nervous disorder.

It occurs in people of both sexes, mostly young people between puberty and thirty, of nervous inheritance, or who have exhausted their nervous system in various ways by dissipation, excess of tobacco, alcohol, venery, or over-pressure of brain work. It is amongst the class of so-called "neurotics" that functional disorders of the heart so largely abound, and it will be

well to try to answer the question:—What constitutes a "neurotic person"? The term is constantly and increasingly used; has it any definite meaning?

A neurosis is a functional, as apart from an organic, disturbance in a nerve centre and the disturbance is generally manifested as an hyperæsthesia. A neurotic person is a person whose whole nervous system, and especially that portion of it known as the visceral nervous system, is hypersensitive and abnormally within his cognisance.

"Neurotic" is sometimes used as a term of reproach; it is often confounded with hysteria, which is indeed but one of its lesser manifestations. It is a condition of nervous system, sometimes acquired, but more often hereditary, very widely prevalent even in our cold-blooded race and which is perhaps a national characteristic in some brighter climates.

The neurotic element is a factor to be reckoned with in practical medicine, and whilst sometimes found amongst the self-indulgent, is quite as often seen in persons with a high degree of self-control, an invincible courage and a restless energy and enterprise. It is especially prevalent amongst the educated classes and is a marked feature in many highly gifted and interesting people.

The tendency of the neurotic is to intemperance in thought and action: he will shrink from a little pain but heedlessly rush into great danger; his cerebration is quick, alert, often fantastical, and he excels in crafts requiring intensity rather than quantity of cerebral

function. If we physicians are sometimes dazzled by his mental brilliancy, his powers of acquisition, rapidity of thought, brilliancy of conversation, we are more often bewildered by his powers of suffering. Introspective in many ways, he is morbidly so with regard to his own physiology. Just as some persons are gifted with an intensity of hearing which enables them almost painfully to appreciate the overtones in music unrecognised by their fellows, or to perceive sounds and impulses that are appreciable only to single specialised faculties of the lower animals, so there are some persons who are in an exaggerated degree sensible of their own organic mechanism, sensitive to the physiological working of that mechanism as distinguished from painful and morbid function.

Our sense of life is probably a pleasurable impression of undiscerned physiology. But it is of our cardio-vascular mechanism that of all functions we most readily become conscious and that, apart from any actual suffering, we most often become unduly conscious, and it is in this department of their physiology that these over-sensitive persons whom we classify as neurotics are most apt to suffer.

Although the attentive observer could at sight pick out from a crowd of persons the two or three neurotics present he would be much puzzled to give his reason for so doing. Perhaps an indefinable alertness of the facial muscles, a quickly changing expression, a mobile and slightly contracted pupil, within creased sclerotic exposure, are the characteristic features.

These persons have a quick circulation, a somewhat raised and variable arterial tension, their thermic centres are unstable and temperature charts with them have to be discounted. Neuralgic affections are common, and amongst them and in their families will be found the other functional nervous complaints, migraine, epilepsy, asthma, hysteria, and the visceral neuroses so well described in this place by our colleague Professor Clifford Allbutt.*

From the social side they are delightfully portrayed in some of the stories of a Member of our College who writes under the pseudonym of "Philip Lafargue." I must apologise for making these digressive remarks on neurotics, but the term has crept into frequent use; I may have often to use it myself in this lecture and I am anxious to give as much definiteness as possible to the idea it should convey.

Functional disorders of the heart are sometimes due to a defect in the organ itself, more commonly they are caused by stimuli reflected from distant organs or parts, generally dependent upon morbid states of the blood circulating through the heart or disturbing the centres of its nervous mechanism, an acquired or hereditary instability of the nervous system being often recognisable.

In endeavouring to lay down the lines of treatment of functional disturbances of the heart we must hold in comprehensive review the vast tangle of circumstances

* Clifford Allbutt, *Gulstonian Lectures*, 1884.

which influence directly or indirectly the now sufficiently well-defined cardiac innervation.

I have endeavoured in this table to summarise the causes of that want of stability which marks the function of the neurotic heart.

TABLE I.

Cardio-Vascular Neurosis.

Definition.—An increased sensibility and a disordered action of the heart and vessels not dependent upon structural change. Want of stability may be located in the cardio-vascular muscle caused by :—

1. Malnutrition . . .	Anæmia.
2. Defective metabolism . .	Fatty infiltration; retention of effete materials.
3. Morbid blood stream . .	Gout; renal or liver inadequacy or surcharge; anæmia.
4. Functional overstrain . .	Fatigue.

Want of stability may be located in the nervous system and due to :—

1. Toxic influences . . .	Specific pyrexias; nicotine; alcohol; digitalis; uric acid and its allies; excessive absorption from ductless glands; deficient absorption from ductless glands.
2. Reflex excitation or depression	Abdominal; gastric, renal, intestinal, hepatic; pelvic; dental.
3. Direct excitation or depression	Emotional; anxiety, fear, anger. Brain disease or injury; concussion, compression, meningitis, cerebritis, &c.

There are three stages or degrees—if we may so speak of them for convenience—of cardio-vascular hyperæsthesia.

The first degree, consisting of that undue appreciation of the heart's action and the blood circulating through the vessels to which I have alluded, is extremely common in nervous introspective people. The heart's action may be quite normal, but it is liable from slight causes to become paroxysmally excited and accelerated. The pulse tension is variable. The patients are all of the neurotic class, the neurosis being hereditary or acquired through the usual causes.

I have described* instances of this degree of cardiac disturbance in a brother and sister whose father died insane, their mother from spinal paralysis, their grandmother was on the verge of insanity, and the brother was highly neurotic. But alcoholic, social, and tobacco excesses and mental overwork will produce the same effect.

The next degree is that in which the heart's action is really oppressed to a point varying from a mere vague anxiety such as that alluded to by Hamlet when he says, "But thou wouldst not think how ill all's here about my heart," to a positive discomfort and onwards to the third degree, the acute suffering of angina.

Increased arterial tension is an essential factor noticeable in the second class of cases. These per-

* "Introduction to Discussion on Functional Diseases of the Heart." British Medical Association Meeting, Bristol, 1894. *British Medical Journal*, Nov. 10th, 1894.

sons, be it remarked, may not be introspective; their attention is not concentrated upon their circulation, but is compelled thereto by actual discomfort or pain.

It is interesting to note that that vague and ill-defined anxiety concentrated about the heart, of which so many of these patients complain, is closely allied in character and probably in mechanism, but in very mitigated degree, with that cardiac terror so characteristic of angina pectoris. Although slight and difficult to define, this discomfort is one of the most common causes of such patients seeking advice "for something wrong about the heart."

The usual symptoms of increased arterial tension are present and are to be traced to the usual causes of that affection, viz., mental shock, anxiety, hurry in work, sedentary lives, numerous and overlapping social engagements, constipation, the threatening of a gouty storm, &c. There is no cardiac lesion necessarily present, although, as we well know, chronic high arterial pressure will in time lead to, and is often attended by, gradual cardiac changes of a degenerative kind.

It is from amongst the first two classes of cases—not distinct but merging into one another—here referred to that the cases of vaso-motor angina come. It is not difficult to see how shock, chill, emotion, dyspeptic distension of nerve-endings, and other causes referred to in Table I., may so increase arterial resistance as to cause cardiac embarrassment and anginal pains. Paroxysmal attacks of palpitation or tumul-

tuous action of the heart are not uncommon incidents in connection with especially the second degree of cardio-vascular neurosis described, the attacks being attributable to sudden vaso-motor relaxation or to vagus irritation from dyspeptic or gouty causes.

Now the first degree of cardiac hyperæsthesia is most common in young adult life in both sexes, but more common amongst males than females; cases are not infrequently met with in females later, about the menopause and even in later life. Those in the second category are far more common amongst males and prevail most from about thirty-five to fifty years of age.

The time at my disposal will not permit me to consider at any length the perverted physiology of neurotic disturbances of the heart and vessels. Its details are well understood—the paths of transmission are anatomically marked out for us; the causes of disturbances of central origin, those originating in irritation of visceral or peripheral nerve-endings, the toxic effect of undue absorption from glands, thyroid, adrenal, ovarian, testicular, as well as those of retained excretory products, from defective elimination or over-production, are all recognised as more or less potent factors in cardio-vascular disturbances; and finally, the effects, immediate or remote, of drugs—digitalis, atropine, tobacco, the whole range of hypnotics and analgesics, cocaine, antipyrin, phenacetin, sometimes prescribed by the medical attendant but sometimes taken without his sanction.

It is very difficult precisely to formulate the harm done by amateur drug-taking for pain, sleeplessness, and spasmodic suffering. It seems to me that it may be clinically summarised by saying that the controlling centres of the nervous system suffer chiefly, emotional disturbances are more easily excited, reflex agitation is less controlled, and the cardio-vascular and thermic centres are diminished in tone.

A neuralgia which in former days necessitated the called for nerve rest is now promptly subdued by a dose of antipyrin or anticalmin, and the patient is enabled thus to take a further step in nervous fatigue without direct suffering.

Neurotic persons as a class take too little food, are always hurried over the meals and in the details of life, they eat too fast and have a tendency to exceed in nerve stimulants, tea, tobacco, alcohol and certain drugs, or they find their excitement in social entertainments.

It is in all cases essential to make a thorough examination of the heart and to come to an absolute diagnosis, for the treatment rests largely on moral grounds and must be supported if possible by an assurance of physical soundness.

If on careful examination the position and dimensions of the heart be found normal, and the character of the impulse and sounds be such as are not incompatible with textural soundness of the valves, an absolute opinion can be expressed.

There is undoubtedly room for anxious consideration

and hesitation in regard to the character of the impulse and sounds of the heart in many of these cases, for the impulse is often violently increased and apparently extended by undue locomotion of the organ and the sounds are perhaps disorderly, reduplicated, and not infrequently attended with murmurs. Still a careful investigation, selecting a time when the action is more tranquil, will in most cases suffice to convince the experienced observer as to whether such sounds are significant of organic disease or compatible with mere disorder.

Functional murmurs do not strictly accord in position and conduction with those due to valve defects. Any such murmurs present are always systolic or post-systolic, often somewhat frictional in character, never in my experience diastolic or presystolic, and most generally are heard with undue loudness over the neck vessels or sometimes are very apparent over the lung even remote from the heart, and especially so during inspiration.

There is no history of rheumatic fever or of previous heart disease.

If the patient who suffers from any disturbance of the heart's action, whether it be mere abnormal consciousness of its action or the most severe palpitation or anginoid attacks, can be truthfully assured that there is no organic lesion, that his troubles, however painful or distressing are not mortal, a most important step is taken in the treatment.

On the other hand, we have most of us seen patients

whose lives have been rendered miserable with the ever-present fear of disaster owing to a hasty and ill-considered diagnosis of a weak or a dilated heart—a diagnosis that should never be made without the gravest sense of responsibility and requiring in some cases more than one careful examination.

It was only very recently that I was consulted by a young married woman, formerly of active, energetic, useful habits, who had been told by a medical man whom she had consulted when away from home that she had a weak heart. She had been taking the utmost care of a healthy organ ever since, resting half the day, never even walking upstairs, until she had become fat, breathless, anæmic, and miserable, and it will be many months before she will be fully weaned back to her former healthy activity, if this ever occurs.

Having come to a diagnosis and reassured the patient with regard to prognosis the next point is to investigate the patient's mode of life with a view to correct physiological errors, if such there be.

A sample day's doings noted down and corrected here and there as the case may demand is an elementary measure of treatment.

The removal of the morning cup of strong tea or its replacement by a small cup of warm milk diluted with Vichy or other water, the arrangement by rising a little earlier for a leisurely breakfast and time for a proper relief of the bowels before entering upon the day's work, the avoidance of rush at the luncheon hour, and the securing of a quiet hour before dinner will, with a

few sensible directions with regard to the dietary, do much to render digestion more complete, and quiet the nervous system. Many of these people have really but little to do, but they are always in a hurry about it.

Another considerable portion who earn their daily bread and support their families by hard and exacting toil are yet impelled by their nervous energies to occupy all their leisure evenings, off afternoons and Sundays, with honorary secretarial duties or teaching or amateur philanthropy—all which duties with a heavy heart but a determined mind the physician in these particular cases has to prune down in order that they may continue to do that which is essential for themselves and their families.

But there is yet another class of men, chiefly in the forties and fifties, who in earlier years have been physically active, even athletic, but of late, with quadrupled professional, business, domestic and social affairs on hand, have lost leisure for exercise, yet preserve their powers of eating and drinking as regards quantity but enriched in quality.

All such tend to venous plethora, retarded circulation in their great organs, heightened blood-pressure, fat-laden and infiltrated heart, and from them a large contingent of functional heart disorders are furnished.

These are the cases in which a yearly course of the waters of Harrogate, Homburg, Carlsbad, Marienbad, &c., are so valuable and in which the terrain cure of Oertel is to be advocated, but a little wise overhauling of the dietary by the physician, the resolute acceptance

of such by the patient, and the adoption of steady daily exercise dovetailed in with the work, will do much to perpetuate cures thus initiated. I shall allude to these cases again and need only now say that their hearts are lazy and hampered, not weak ; they require sensible guidance not to have cardiac introspection as an administered neurosis.

Having (1) given an absolute diagnosis, and (2) having investigated and corrected the habits of life in whatever respect they may be faulty, we have (3) to ascertain and remove—or, at least, to treat—the exciting cause of cardiac disturbance. These are for the most part of reflex origin—gastric, intestinal, rectal, and renal.

I have seen very striking instances of great functional disturbance of the heart and sometimes also pulsation of the abdominal aorta attended with floating kidney. Exostosis, bad teeth and other sources of distal irritability are frequent causes of disturbed cardiac innervation.

A married woman, aged thirty-six years, seen with Dr. Armstrong of Buxton, had for two years suffered from excessive cardiac irregularity and frequent attacks of spasmodic heart pains. She attributed her illness to much previous mental anxiety. Her symptoms had increased the last few months and the cardiac disturbance became so constant that she could neither go into society nor receive friends.

There was no valvular disease of the heart and its dimensions were normal, but the action was most

irregular and intermittent. Her teeth were extensively decayed, surrounded with tartar, and the gums were unhealthy. She had declined to have them seen to, however, and she was put through a course of Nauheim baths and resistance exercises and her digestion attended to with only slight relief.

After the consultation she consented, on March 28th, 1897, to have all her affected teeth removed under gas and ether, which she took well, and from that time her cardiac symptoms have entirely ceased, although Dr. Armstrong adds:—"She has been exposed to even greater nerve-strain than before." In this case there were no marked dyspeptic signs and the cardiac symptoms seemed to be due chiefly to the reflected irritation of the decayed teeth.

Professor Clifford Allbutt* in his Gulstonian Lectures alludes to many cases of cardiac attacks of a functional kind, with very slow, quick, or intermittent action and in some with distinct anginal symptoms, which he had observed to occur in connection with, often in succession to or alternately with, some form of visceral neuralgia, especially gastralgia, or some uterine disturbance, such as menorrhagia.

Professor Allbutt points out that pulmonary gastric and cardiac neuroses are often concurrent in families, and I have seen a striking instance in which they have each been present at different times in the same individual.

Here it is clear that we have to do with a central

* *Loc. cit.*

neurosis manifesting itself in different viscera at different times. Professor Allbutt is, moreover, careful to point out that in his cases of cardiac disturbance following gastralgia there was no dyspepsia proper. The causes of high tension other than those mentioned must be looked for and, if possible, treated. The gouty disposition has to be reckoned with.

In this department of inquiry and rectification will come the causes of those conditions of the heart muscle which, rendering the organ especially irritable and inadequate in function, are accountable for breathlessness, palpitation, and spurious anginal seizures.

Fatty infiltration of the inter-muscular texture and incomplete removal of waste materials from the cardiac muscle briefly constitute the pathology of these cases.

Venous plethora is the marked feature in them all, and graduated exercises, restrictions in diet and hepatic depletory medication are the principal measures of treatment.

The diet should in these latter cases be carefully looked to. It should be spare, slowly eaten, taken at regular meal-times only, and may consist of a good breakfast, a moderate amount of fresh cooked meat without fat for luncheon, and poultry or game for dinner. Starchy and root vegetables and bread should be removed, or only very sparingly allowed with the lunch and dinner meals, crisp toast or biscuits being substituted for bread. The amount of fluid taken with the meals should be restricted in decided cases to a claret glass with luncheon and two glasses with dinner.

This may consist of one or other of the light wines or diluted spirit in measured quantity. About from an hour to two hours after or from half an hour to an hour before meals a glass of plain hot water should be slowly sipped to supplement the fluids taken.

I shall deal further with the question of exercises for these patients later when speaking more specifically of the Oertel and Schott methods of treatment, which are particularly adapted to them.

The great principle that underlies and should govern the whole treatment of functional and neurotic heart affections is a steadfast endeavour to help the subjects of them through with their lives and not to make invalids of them or to allow them to become so.

They may require treatment for definite times, amongst them one even meets with some rare neurasthenic cases requiring the Weir Mitchell treatment, they may require restraint in definite ways—perhaps some limit marked out in their work; but the utmost care must be exercised to discourage the introspective habit to which they are particularly and from the very nature of their malady prone.

Where social engagements and professional or other work overlap one or other must of course be curtailed.

It is at the same time of the utmost importance to secure to these people their interest in their surroundings and not ruthlessly to interfere with such duties and amusements, philanthropic, religious, or social, as may be the salt which savours their doings. We have to adjust, to apportion, not to spoil the daily life.

All instrumental treatment or observations of them should be avoided. They should be enjoined to take moderately active open-air exercises, during which they should be directed to take the deepest possible inspirations, so as thoroughly to ventilate the lungs and stimulate complete cardiac circulation. Great temperance in alcohol and tobacco and moderation both in tea and coffee must be observed. For those who are delicate, easily fatigued, or mentally hard-worked a period of rest before meal times must be insisted upon and particularly before the late dinner.

In the more pronounced cases the passive exercise and soothing monotony of a well-planned sea voyage is sometimes very advantageous, only, however, for those who are able to eat and sleep well on board ship. The restful regime of a spa suits others, the particular spa being selected for its chalybeate or its eliminative effects as the case may require.

Again the more formulated treatment by surface stimulation from aerated saline baths, combined with rest and passive resistance exercises, proves very beneficial in some cases, more particularly those in which there is a gouty element, the arterial tension ranging high and nervous introspection not being too marked a feature.

A definite course of spa treatment is often useful—indeed, sometimes essential—in serving the purpose of inculcating the habit of self-discipline and starting the patient on a better regulated and more physiological plan of life.

Drugs are of course often required in the treatment of functional disturbances of the heart, purgatives or laxatives, and particularly an occasional mercurial to lower arterial tension and to remove irritating materials. Sometimes nerve sedatives of the bromide order are required, or hæmatinics, especially arsenic and iron, as tonics to the nervous system and blood restorers. Strychnia is badly borne by patients of the neurotic class, except in small doses for short periods, and where a cardiac tonic is required, caffein is more appropriate.

In cases of venous plethora a course of salines is sometimes necessary and in gouty cases suitable remedies. It may, however, be said that there is no special drug treatment for cardiac neuroses except in some of the acute and stormy manifestations to be next considered.

It is a fact which is perhaps too often forgotten in clinical medicine, but which I am sure the experience of those present will recognise, viz., that functional disturbance similar in kind to those we have been considering is as frequently observed in association with diseased as in healthy hearts and that many of the troubles and some of the catastrophes of cardiac disease are attributable to functional derangement.

In speaking, therefore, of the treatment of angina pectoris in its place amongst cardiac neuroses, I shall deal with it in so far as it occurs as a neurosis both in connection with healthy and unhealthy hearts, and I shall reserve the other forms of angina for later consideration.

The subject of angina pectoris is a difficult one enough to formulate with regard to etiology and morbid mechanism with a view to prophylactic and remedial treatment. The difficulties diminish when we recognise that there is a continuity in the phenomena presented to us for treatment from the slighter degrees of introspective recognition of the cardio-vascular mechanism, through the more distinct evidence of cardiac anxiety and distress in connection with the higher and more persistent grades of arterial tension to the paroxysmal attacks of acute breast pang associated with a veritable asthma of the blood-vessels which may supervene in any cases of the series, and this continuity is to be observed between so-called false and true angina, although some writers will not admit the term angina except as applicable to the fatal cases of coronary origin.

We have discussed the neuroses, we have briefly alluded to points of treatment for the condition causing the high tension and leading up to the paroxysms, and we must now briefly outline the treatment of the paroxysm itself.

In a large proportion of cases angina pectoris is an entirely functional disorder, the main feature of which is sudden increase of blood-pressure and a correspondingly sudden call upon cardiac effort; it may be on the systemic, it may be on the pulmonary side of the circulation that the strain arises.

There are many causes that will bring about this arterial spasm and there is the underlying neurosis

that favours its occurrence. The causes are almost all within our scope of remedial treatment and the neurosis is subject to considerable modification and control. But it is important to remember that in all these cases whilst it is the heart that suffers the angina, the conditions which originate that suffering are outside the heart, and all our treatment is directed in the first instance to alter these external conditions and in the second to support the heart.

There is no essential difference save in degree, and not always in degree, between cases of angina in which the heart is sound and those in which it is unsound, but there is every difference in the gravity of prognosis and the urgency for treatment in the two cases. For whilst on the one hand the man or woman who has angina with a sound heart is in no danger of dying, and the object of treatment is to relieve suffering and avert alarm until the perverted physiology has time to rectify itself; in cases, on the other hand, in which there is unsoundness of heart, whether textural or valvular, the patient is in imminent danger and requires prompt treatment to relieve suffering and to avert death if death can be averted.

The cardiac pain in vaso-motor angina is difficult satisfactorily to explain; it is distinctly a result of intra-ventricular pressure and from its character and radiation it must be primarily an affection of the sensory nerves of the heart caused by stretching of its tissues and causing the contraction of the tissues to be attended with pain.

The endocardial surface is more sensitive than the pericardial surface of the heart; but comparatively insensitive tissues, when stretched become very painful.

Dr. Allen Sturge* observes that reflected pain is only an ordinary sensation conveyed to a nerve centre in commotion by which it is intensified to a painful sensation. Thus may the reflected pains be accounted for as emanating from the centres disturbed through the cardiac nerves.

Contrariwise we have only to conceive a slight degree of hyperæsthesia of the visceral nerve centres to account for that undue perception of the cardio-vascular mechanism which is the first grade of neurotic disturbance and which can readily become a painful perception of increased pressure within the heart.

The two points requiring consideration in an anginal attack of the kind now under consideration are the pain and the degree of heart failure.

The pain, which is to a certain extent the measure of the strain upon the heart, is to be attacked by remedies which relax arterial spasm. Amyl nitrite, nitro-glycerine, and the nitrites generally, but especially nitro-glycerine, 1 min. of the 1 per cent. solution may be given at intervals of five minutes for two, three, five, or more doses, and at the same time that the anti-spasmodic is given an appropriate cardiac stimulant is required.

In the more purely neurotic cases it is most desirable

* Allen Sturge, *Brain*, 1882-83, vol. v., p. 492.

to avoid alcohol. There is no better stimulant than slowly sipped hot water. Kronecker* has pointed out that sipping is a physiological stimulant to the heart and hot drinks tend to relax arterial spasm.

A prescription for a carminative draught, including ammonia, chloric ether, and valerian or cardamoms is valuable to be taken in several sips. Warmth to the surface and especially to the extremities is the further requisite.

The second stage of these cardio-vascular attacks is one of reaction and excitement to be followed by fatigue.

Often by the time the medical observer arrives the cardiac pressure has already been relieved through the depressor nerve of the heart, excited by intra-ventricular pressure, bringing about relaxation of arterial spasm, probably by inhibiting constrictor influences, the first violent throbbing or the threatened standstill of the heart has already yielded to quick, perhaps somewhat irregular, beats, the tension of the pulse is no longer apparent and this fact has no doubt led many observers to question the alleged mechanism of this form of angina. With the help of a few hours' rest in bed the patient may be again fit for the duties of life, although usually a sense of lassitude and fatigue remains for a few days.

It is now that the cause of the attacks must be sought out, the conditions of the heart carefully ascer-

* Quoted by Lauder Brunton, "Disorders of Digestion," London, 1886, pp. 11, 21 and 57.

tained and the daily life, diet and surroundings and functions of the patient must be investigated and corrected where in error. Thus is outlined the bare treatment of the anginal attack.

If there be no heart disease present the patient must be thoroughly reassured on that point. In cases, however, in which there is heart lesion present much more attention must be given to the after-treatment and the prognosis depends upon the nature of the lesion present. It is not my duty here to enter upon this latter point.

I would briefly say that the gravest cases are those in which there is enlargement of the heart without or not accounted for by valvular defect. I would mention the fibro-fatty heart, the syphilitic heart, and the renal heart in this category.

Aortic stenosis and aortic regurgitation come next, the regurgitant defect being by far the most common. Mitral stenosis is not infrequently attended with anginal seizures, sometimes of a fatal kind, and the attacks would probably be more frequent were it not for the readiness with which pulmonary hæmorrhage occurs.

I had recently in my ward a young man admitted with a second attack of rather severe pulmonary hæmorrhage which the physical signs showed to proceed from the base of the left lung.

On examining the heart it was found to present the pure funnel form of mitral stenosis with right ventricle hypertrophy, &c. His pulse was observed to be re-

markably tense with well-marked reflux through the palmar arch on compressing the vessel.

Under treatment by saline aperients and a little mercury the hæmorrhage ceased, the pulse softened, and he returned to his former state and left the hospital.

The heightened peripheral arterial resistance in this case, by embarrassing the left ventricle and throwing back pressure upon the already difficult circulation in the lungs, clearly caused the profuse hæmorrhage, whilst the hæmorrhage in turn probably saved him from anginal heart failure.

Mitral regurgitation as the primary disease is rarely accompanied with angina, and when it supervenes upon cases due to degenerative hypertrophy and dilatation it tends to preserve the patient from future attacks.

Now on all these cardiac conditions anginal attacks may supervene, having precisely the same mechanism as the attacks I have already considered as unattended with cardiac disease, and the treatment is precisely on the same lines, only it must be more urgently pursued, for the heart may readily fail under the initial strain and can scarcely escape damage therefrom; moreover, the subsequent fatigue is far more serious.

A young man was admitted into my ward with well-marked aortic regurgitant disease with characteristic pulse and throbbing of neck vessels.

He had many attacks of vaso-motory angina, a common event in aortic regurgitation, one of which supervened whilst he was under examination.

It was curious to note the absolute extinction during the attack, of all the aortic characters in the pulse which became contracted to a small, hard, pulsating thread, whilst as the patient sat forward leaning against a chair, in great pain, the bed shook with the violence of the cardiac beats and his neck and subclavian vessels could be seen pulsating with responsive violence.

A dose of trinitrine quickly brought back the characteristic aortic features of the pulse and dissolved the painful scene.

One could not observe the labouring beat of the heart, the strongly pulsating large vessels contrasted with the almost effaced small vessels without appreciating the power of vaso-motor contraction to cause cramp or paralysis of a weak ventricle, yet their are physicians who still doubt the efficacy of vaso-motor spasm in the mechanism of angina.

The initial treatment may be started with nitrite of amyl inhalation and the patient should always have such at hand. But the attack is commonly attended with such acute heart failure that the clinical features of high pressure pulse and labouring heart may be immediately lost.

Undoubtedly the subcutaneous injection of pure ether to which a minim of nitro-glycerine solution may be added if not already otherwise taken, is the best treatment in severe cases if caught at the right moment. The sense of prostration is greater and more defined in these cases.

Alcoholic stimulants, so much to be avoided in pure vaso-motor cases, are in these imperative. A full dose of brandy should be given in some hot drink.

In those cases, and they are many, in which flatulent distension forms a marked feature of the attack, if it be not concerned in producing it, a carminative draught is of much service at the earliest stage.

The heart is left in an exhausted or fatigued condition after the attack and there is a decided tendency to a series of several attacks. For this a mixture of strychnine or caffein may be prescribed with digitalis, so that 15 or 20 minims of liquor strychnia and 20 or 30 or 40 of tincture of digitalis are given in twenty-four hours, and the strychnia may be given subcutaneously in, of course, equivalent doses or the caffein in form of salicylate.

It is probable that digitalis and strychnine influence the heart muscles before that of the vessels, but if the pulse become tightened, as it may be in exceptional cases, the digitalis must be lessened or its effect on the vessels moderated by the addition of $\frac{1}{2}$ minim or 1 minim doses of nitro-glycerine to the prescription.

There is another remedy which is a powerful restorative to the fatigued heart, and that is oxygen inhalation, which may be given for five or ten minutes every hour or two or three hours as may be required.

These cases often come to us with a history of a recent attack and we have to consider what form of angina it has been, how to avert fresh seizures, and how to repair (if it may be) the failing heart which renders each attack so dangerous.

The presence or absence of heart disease must be rigorously ascertained—(1) the soundness or otherwise of valve function; and (2) the presence or absence of enlargement, dilatation, or hypertrophy of the organ.

It is important not to form too hasty a judgment and it is often impossible to come to a final diagnosis at or immediately after a seizure.

In tumultuous action, whether from excitement or violent work, the locomotion of the heart is greatly increased and an inexperienced observer is apt to find great enlargement, displaced apex beat, &c., when none exists. On the other hand, one hears it sometimes maintained at inquests and the like that considerable organic disease of the heart may exist without any recognisable signs.

I would venture to say that a careful investigation of the sounds and dimensions of the heart will always establish in such cases a displaced apex beat, an increase in the dimensions, or a recognisable alteration in the sounds of the heart. The converse is, however, frequently true—viz., that much alteration in the heart is conceived to be present when none exists. It requires great precision and diagnostic courage to prove a negative and in the presence of functional disturbance and discomfort and anæmic bruits mistakes in diagnosis are very frequent and easily made.

With mitral regurgitation of rheumatic origin high tension pulses do not often supervene, but mitral insufficiency is frequently a sequel to the dilatation of the heart consequent upon chronic high tension and

secondary cardio-vascular changes, and under these circumstances it is undoubtedly a safeguard against over-distension of the ventricle. I have seen cases in which the establishment of mitral incompetence has produced a cessation of anginal attacks which had previously occurred from time to time.

In senile hearts mitral regurgitation is common and is not to be looked upon seriously, but rather as a favourable element in prognosis—a condition normal to the senile heart.

Tachycardia, Bradycardia, Exophthalmic Goitre, &c.

I must frankly confess that neither reading nor a considerable experience of cases has enlightened me to anything approaching an exact appreciation of the mechanism of that persistent hurry of the heart's action which is known under the term—a term which responds well to our ignorance—tachycardia.

The chief feature of the cases may be briefly enumerated:—1. A persistent hurry of pulse lasting for periods varying from hours to many weeks, during which the pulse is rapid, from 120 to 200 or more, regular, small, of sustained, I should say, rather than of high tension.

2. Intervals of severe palpitation attended with precordial pain, notable distress, and more tumultuous, irregular action of the heart.

3. Although murmurs may be heard and the cardiac

dulness may be broadened during attack, in the intervals the dimensions and sounds of the heart may in the earlier stages be perfectly normal.

4. In the earlier stages and in the most characteristic cases the heart hurry has been observed to begin and to finish quite abruptly. This was so in Dr. R. P. Cotton's* case and in Sir T. Watson's, in the latter the pulse suddenly changing from 216 to 72 with subsidence of all symptoms whilst that physician was still in the room.

5. So far as any exciting cause can be stated it has been for the most part mental shock, mental or physical overstrain.

The above characteristics are sufficient to show, were demonstration needed, that the condition is a pure neurosis and that the neurosis must be either of the vagus or sympathetic cardiac centre seems fairly certain. It is inconceivable that a paralytic affection of the pneumo-gastric centre should be so persistent, should be attended with a regularity of rhythm so generally notable, and should be capable of such abrupt termination as is observed in some cases.

The view of sympathetic excitement is perhaps better supported by other phenomena of sympathetic irritation, such as sweatings and flushings of the face. No auto-intoxicant can be recognised in most cases.

It is worthy of remark, on the one hand, that many people, especially women, suffer from persistent hurry

* R. P. Cotton, *British Medical Journal*, 1867, vol. i., p. 629.

of heart, coming quite within the range of the lower degree of tachycardia, and on the other that there is nothing to distinguish such simple tachycardia from that which is the constant symptom of exophthalmic goitre, the rhythm and quality of pulse being precisely the same.

It is also to be remarked that there are cases which might be regarded as of a transitional kind, in which, with no enlargement of the thyroid and with no more than a slight beadiness of the eyes, there are present the characteristic hurry of circulation, cardiac murmurs, &c., and in other cases again these circulatory phenomena precede the thyroid enlargement.

In the case of a lady, to which I have elsewhere referred,* there was observed, besides moderate but constant tachycardia and slightly prominent eyes, evidence of instability of another portion of the pneumogastric nerve in the occurrence of vomiting as an accessory to any, however slight, mental effort or anxiety, such as starting on a journey or to pay a call.

This neurosis was apparently attributable to anxiety during the long illness of her mother. It lasted for two or three years and then the patient got well.

That there is vaso-motor paralysis of the thyroid vessels in the pathology of the goitrous form of tachycardia is evident, but it would seem to me to be a local and collateral phenomenon, for there is no general evidence of vaso-motor inhibition, the pulse is generally rather small and hard, as one might expect with

* "Discussion on Functional Diseases of the Heart," *loc. cit.*

such rapid impulses of blood through the vessels calculated to maintain blood-pressure.

For the present, then, the exact meaning of tachycardia must remain unsolved and we may associate it with some other clinical facts, such as persistent elevation of temperature and unexplained continued elevation of arterial tension, the morbid physiology of which is not yet apparent.

The theory of exophthalmic goitre maintained by Möbius,* Johnston,† Greenfield,‡ Murray,§ and others, that it is due to an excessive formation and absorption of thyroid secretion and its action on the nerve centres in the medulla, is useful if only as a working hypothesis.

This hypothesis has been suggestive of certain measures of treatment that have been devised for exophthalmic goitre and more successfully for its opposite myxœdema. It would appear to be at least proximately true, although probably some central medullary change precedes the thyroid phenomena and is responsible for them. Some regard the thyroid secretion as modified and having toxic effects.

This theory is based upon certain very definite observations, viz.:—1. That no definite lesion of nerve cen-

* Möbius, "Centralbl. f. Nervenheilk.," 1887.

† Johnston, *Lancet*, 1893, vol. ii., p. 1121.

‡ Greenfield, "Bradshaw Lecture," *British Medical Journal*, 1893, vol. ii., p. 1261.

§ Murray, *British Medical Journal*, 1896, vol. ii., p. 893.

tres has been found. 2. That the thyroid is the organ more obviously affected than any other. 3. That its structure is altered in the direction of hypertrophy and over-activity of function and possibly there may be some alteration in the quality of the secretion (Möbius, Murray, Joffroy* and Achard). 4. The symptoms tachycardia, nervous irritability, insomnia, and vibratile contraction of voluntary muscles are the reverse of the bradycardia, torpidity, and impaired reflexes characteristic of myxœdema, consequent upon atrophy or excision of the thyroid. 5. Whilst moderate doses of thyroid extract will cure or keep in abeyance the phenomena of myxœdema an overdose of the extract will produce symptoms resembling those of exophthalmic goitre.

There has as yet been found no direct means of treating simple tachycardia successfully. Drugs of the digitalis class are useless in this as in almost all cardiac neuroses, except—and the exception is important—in the treatment of the heart fatigue which sooner or later ensues as a consequence of the functional strain on the organ.

Tachycardia in its various grades is, however, often but a symptom, a prominent expression of a neuropathic state which requires to be approached for treatment from many sides.

In exophthalmic goitre, again, having made the diagnosis, the physician has to deliver himself of the

* Joffroy and Achard, "Arch. de méd. exper. et d'anat. path.," Paris, 1893, v., p. 807.

somewhat magisterial sentence, "Imprisonment for six months and under surveillance for from two to five years."

A careful and resourceful observance of this sentence is the only means of radically dealing with this distressing complaint.

It would be astonishing that a sudden shock could produce a functional disorder that required such prolonged care did we not know that in all cases the condition is one long prepared for. In some cases a prolonged anxiety or mental strain will account for the illness, in others there is apparently a perverted physiology such as a premature menopause from removal of the ovaries.

In other cases again the cause is inscrutable, but in all cases the fundamental treatment by physical and mental rest is essential. The rest for the first six months should be absolute on bed, sofa, or on a couch in the open air, with the utmost avoidance of all excitement and mental fatigue.

The patient can then be promoted to bath-chair exercise, quiet walking and driving, or more scientifically graduated exercises, and in the course of time recovers.

The general well-being of the patient can be maintained and the more distressing local and general symptoms relieved or removed by cold applications to the throat, sedatives of the bromide and valerian order, arsenical and sometimes iron tonics; digitalis and the like drugs may be given on the appearance of heart

fatigue, indicated by the signs of dilatation and a pulse irregular in time and force.

The use of thymus extract is in my experience of some value in diminishing the rapidity of the pulse; the galvanic current has been found useful in some cases.

Theoretically the Nauheim brine baths should be useful, but practically I have seen no good from them —at least in the more acute stages.

The treatment of constipation and proper dietetic support are all matters of great importance under the enforced quietude of the patient.

Operative treatment by partial extirpation of the thyroid gland has been rather extensively tried as has also section or partial resection of the sympathetic nerve in the neck. It must be remembered that any surgical operation will in a certain proportion of instances, in some manner unknown, modify, perhaps even cure, a pure neurosis. Mr. Treves* has recently given some instructive illustrations of the truth of this statement, as regards abdominal neurosis, in a paper recently read before the Medical Society.

The partial removal of the thyroid gland in the acute stage of the disease is attended with very considerable danger and only very inadequate success. The best cases were those of Mr. Paul of Liverpool, but of his six cases recorded in the *British Medical Journal* for

* Treves, *Med. Soc. Trans.*, 1894, vol. xvii., p. 125; see also *Brit. Med. Jour.*, 1896, vol. i., p. 1.

1897, vol. ii., p. 6, all except one were of more than two years' standing.

Abadie and Faure* have had successes from section or ablation of the cervical sympathetic, but of Faure's three cases one was of twelve years' standing and in the others the duration is not stated. Doubtless the section of the sympathetic will slow the heart, but it has not yet been satisfactorily shown to influence the disease, and one would regard with some misgivings the future of a heart deprived of due sympathetic innervation, whilst it is clinically remarkable how well the heart comes out of the long struggle but little damaged when the patient has been carefully steered through by judicious handling.

It sometimes happens that a disfiguring enlargement or a more serious distortion of the thyroid remains after the tachycardial symptoms have subsided, and in one instance I have seen this condition dealt with very successfully by removal.

I can but repeat that in our present knowledge of pathology and therapeutics bearing upon tachycardial conditions, including exophthalmic goitre, all remedial measures, however valuable some of them may be on proper occasions and at proper times, are absolutely futile unless they be subordinated to the essential treatment by graduated rest and isolation from all worry, fatigue, and excitement.

Of the opposite more rare form of cardiac neurosis, bradycardia, I need not say much, for the cases require

† *Progrès Medicale*, 1897.

but little treatment. One form is that which sometimes follows upon the rapid heart of exophthalmic goitre.

A few months ago I had a remarkable example of this in my ward at the Middlesex Hospital. The patient was a woman, aged sixty years, who twenty years ago was operated upon by Dr. Galabin at Guy's Hospital for ovarian disease and both ovaries were removed. She almost immediately became the subject of acute Graves' disease.

Ten years later she came under the observation of Dr. Pringle as an out-patient at the Middlesex Hospital still presenting all the symptoms of active exophthalmic goitre,—proptosis, enlarged and pulsatile thyroid, a pulse of 136, agitations, tremors, sweatings, &c. She could not come into the hospital but continued her attendance, coming periodically from the east side of London for many years, in the course of which, chiefly under small doses of aconite, belladonna, and bromide, her thyroid gradually dwindled to an atrophic state, her pulse slowed to 60, and her manner changed from one of excitement and nervous agitation to a quiescent, almost an apathetic, demeanour. She still preserved her proptosis, which she has at the present time.

At no time did Dr. Pringle or Dr. Pasteur, under whom she had more recently been as out-patient, regard her case as presenting the distinct signs of myxœdema. She had no albuminuria, but latterly her legs became somewhat œdematous. Her heart has slowed down to

45 and 30, there has been for some time a basic systolic murmur, and the left ventricle is decidedly hypertrophied and somewhat dilated. The signs are rather those of degenerative roughening, however, than of constriction of the aorta, for the pulse is of fairly full volume and regular, although very slow. After a few weeks' rest in bed and some strychnine tonic she has gone to the convalescent home.

This seems to be a case analogous with regard to the myxœdemic state to those cases of tachycardia I have spoken of as not being distinctly associated with Graves' malady and yet approximating to it.

Bradycardia is very uncommonly associated with well-marked myxœdema and may continue notwithstanding the disease has been cured or held in check by thyroid treatment. I have seen it in epileptics, in which case the rhythm is not only slow but generally irregular.

As a temporary condition bradycardia is not infrequently met with as a sequel to influenza, and also in association with the stage of depressed temperature that frequently follows upon other fevers. In the influenzal cases that I have seen it has been associated with a very high density of urine, with great surcharge of urea, as though there had been some previous accumulation, the urine becoming solid with crystals on the addition of cold nitric acid. Spurious anginal seizures are sometimes observed under these circumstances. I have never known such to prove fatal, although of course in the presence of any previous

heart disease they might readily prove so. Chronic high arterial tension is generally associated with a slow, sometimes a very slow, pulse, whereas in acutely raised tension the heart's action is, as I have pointed out, generally quickened.

In chronic bradycardia, a condition that tends to remain permanent and does not necessarily shorten life, an occasional twenty-four hours' rest in bed should be enjoined and for mental work the recumbent posture should be preferred.

In cases of a more temporary kind the combination of strychnine with an alkali or iodide of potassium (the two drugs being kept in separate bottles and only mixed at the time of taking) is a very useful one. Caffein is also very useful, especially where the urine is scanty. A five minutes' whiff of oxygen three or four times in the twenty-four hours is a valuable cardiac stimulant.

In cases of myxœdema of course thyroid extract will be given, but it is not wise to push it to the production of any excitement of circulation.

LECTURE II.

THE general line of treatment of acute inflammatory diseases of the heart is the same in the vast majority of cases. We have chiefly to consider the fundamental complaint of which the cardiac affection is in most cases a part, and this disease is, in the majority of instances, acute rheumatism.

Now, from the heart point of view, and indeed, from any point of view, I think all authorities are agreed that the right treatment of acute rheumatism is absolute rest in bed in woollen wrappings, a free relief of the bowels, and the administration of salicylate of soda in efficient doses in combination with such alkaline remedies as the condition of the urine may suggest.

It was shown very emphatically by the late Dr. Sibson* that the difference between absolute and incomplete rest in the treatment of acute rheumatism was an exemption from heart complication of 71 per cent. as contrasted with 44 per cent.

We never see now those cases of acute rheumatism involving from three to six weeks' acute suffering so little influenced by treatment as to render possible the

* "Collected Works," vol. iv., p. 347.

warm discussions of not thirty years ago at our clinical societies respecting the relative merits of alkaline drenches, multiple blisters, or mint-water drinks and dry cotton-wool applications in that disease. But few cases endure more than five days' suffering under the salicylate treatment, and a treatment of the general disease thus successful can scarcely fail with due care and foresight to prove in some degree preventive of cardiac lesions, which are true manifestations of the rheumatic poison usually of somewhat later appearance than the joint phenomena.

The earlier statistics, both with regard to the influence of salicylates and of other drug treatments in lessening the tendency to heart disease in rheumatism, are for the most part valueless, being based on hospital cases, the previous existence of heart affection not being certified and the treatment before entering hospital not given.

It can scarcely be doubted, however, that the current view that salicylates do not lessen the liability to cardiac lesions is founded on the fallacy that cases early relieved of pain and fever by salicylates are often allowed to get up too soon. The so-called relapses are rightly described by Dr. R. P. Howard* as rather "recrudescences of a disease not yet terminated."

The average time spent in hospital for acute rheumatism, thirty days, is nearly the same under all treatments, the full alkaline method having a slight

* Howard, "Pepper's System of Practical Medicine," 1885, vol. ii., p. 51.

advantage, and during the greater part of this time the patient must remain in bed under strict treatment by warmth and rest and appropriate drugs. Salicylate remedies do not alter the actual duration of the rheumatic poison.

If, therefore, on the relief of pain and reduction of temperature the patient be regarded as convalescent and be allowed out of bed he assumes the position of one with acute rheumatism still upon him treated with incomplete rest and so becomes doubly liable to cardiac manifestations.

I may pass by the local treatment of cardiac disease in rheumatism with the remark that it varies according to the views of particular physicians. There is no doubt that a certain few cases are wisely treated variously at the physician's discretion by cold or warmth, by blisters or leeches, according to particular indications. It cannot be said that any one plan of treatment is to be recommended as superior in all cases.

Whilst the treatment of acute cardiac diseases in rheumatism is not guided by stethoscopic indications, I need not in this place remark that in any febrile illness in an infant or child until its nature be fully declared, the heart must be especially scrutinised again and again. For cardiac rheumatism is in the young child frequently associated with little or no joint manifestations. Dr. Barlow*, Dr. Warner and Dr.

* Barlow and Warner, "Trans. Inter. Med. Cong.," 1881, vol. iv., p. 116.

Cheadle* have drawn special attention to the presence of painless superficial fibrous rheumatic nodules in young subjects and Dr. Cheadle regards these as especially apt to be associated with severe cardiac affection.

My point of view with regard to children's rheumatism is that the frequency with which it is overlooked in the early days of the disease is responsible for much of the peculiar gravity and frequency of cardiac lesions in the young child. Such cases come indeed into the category of those incompletely treated by rest and therefore especially liable to heart implication.

And why should rest, absolute recumbency, be so important in acute heart affections? We cannot still the heart, but we can lighten its burdens and lessen its restlessness. The mere difference between lying down and standing up to the healthy heart is 10 beats a minute or 600 beats an hour. How much greater may it not be to the heart irritated by acute disease?

The pulse naturally quickens as the temperature rises. Hence by mitigating pyrexia we *cæteris paribus* rest the heart. It is generally held by pathologists that pyrexia lowers arterial pressure, but the conditions that attend rheumatic pyrexia, multiple joint inflammation and excessive metabolism with high density of urine would favour heightened arterial tension.

Our alkaline and salicylate remedies reduce arterial pressure both directly and indirectly by stimulating skin

* Cheadle, "The Rheumatic State in Childhood," London, 1889.

and kidney function. So that the general remedies most applicable to the fundamental disease are at the same time specially suitable for the requirements of the local malady.

Are there any special remedies to be employed for the heart condition? There are but few.

The group of heart medicines is not, as a rule, applicable until the case has fully emerged from the general disease, and has become a single organ malady. It may be said, generally speaking, that digitalis and its class are useless in acute inflammatory heart affections and that aconite, with certain exceptions, is harmful. Mercury has long been abandoned with venesection and other violent measures.

There are two forms of cardiac lesion, however, which may frequently be treated by moderate doses of opium with great advantage. They are peri- and myocarditis, conditions often conjoined, the especial indications being pain particularly manifested in some (not all) cases of pericarditis and irregularity of rhythm, tending to tumultuous action with failing power, characteristic of myocarditis. The pain of myocarditis is never acute unless there be also pericarditis; it is rather a restlessness and an indefinable oppression written in the face and movements of children and described by adults.

Small doses of opium at frequent intervals are of very great service in such cases, calming nerve irritation, lessening general restlessness, and so securing more rest to the heart.

Endocarditis in rheumatic fever affects the mitral valve most commonly, the aortic orifice much less frequently; the more complex mitral flaps stiffened, and with their opposed surfaces thickened by vegetations, permit of regurgitation, whilst the aortic valves, losing their flaccidity and being roughened by vegetation, are unduly salient during systole and so cause obstructive murmurs.

Neither of these conditions call for, or respond to, at this stage any treatment additional to that already laid down for the dominant complaint. It is somewhat inadequately argued that salicylate of soda does not influence heart affections in rheumatic fever. This view is founded upon a manifold misconception.

In the first place, the murmur or pericardial friction heard in endo- or pericarditis are results of altered mechanism rather than evidences of active disease. Their continued presence does not show unchecked activity of lesion nor could they be expected to disappear like the fading blush over the rheumatic joint.

More than this, cardiac rheumatism affects a part in constant functional activity, to which the term rest is only relatively applicable, and, further, the mild degree of daily pyrexia, which is often prolonged in endocarditis, is probably partly due to contamination of the blood-stream by sero-fibrinous material exuded from inflamed surfaces, which, although not septic, has yet become foreign through alteration by products of cell proliferation.

After the third or fourth week the salicylates may be replaced by quinine and arsenic as remedies better suited to combat this phase of the malady.

There are various considerations which emphasise the importance of more prolonged rest in cases of acute rheumatism accompanied by cardiac lesions.

The difference is a striking one between ephemeral results of other rheumatic inflammations in a joint or even in a fascial membrane and the same affection of a cardiac valve, the pericardial sac, or even the pleura. But this different result is well accounted for by the condition of unrest that in different degrees obtain in each of the three latter parts.

This condition depends on an automatic mechanism happily beyond our control, but, as pointed out in speaking of the acute phase, we can very materially lighten the labour of the heart and lessen the strain upon the valves by maintaining the body in recumbent repose.

It is true that in the milder cases of endocarditis the inflammation may be mainly seated at, or even limited to, the lines of contact of the valves, the points of greatest strain, as has been pointed out by Moxon*, Sibson† and other authors, but in more severe cases the whole valve partakes in the inflammatory hyperæmia and is the more liable to become so involved the more it be subjected to premature functional strain. And for a

* Wilks and Moxon, "Pathological Anatomy," London, 1875, p. 128.

† Sibson, *loc. cit.*, vol. iv., p. 233.

considerable time after acute inflammation has passed, a time varying much in different cases, a smouldering endocarditis goes on attended with a slight daily rise of temperature, so slight sometimes as to be ignored by the attendants, and during and beyond all this time absolute rest is necessary.

The valves are softened and thickened by nuclear granulation tissue and new fibrous formation. They readily yield and become distorted under any increase of blood-pressure, whilst the nuclear tissue further developes into hard and contractile cicatricial tissue which fixes and further distorts the valve.

It occasionally, but not often, happens that after the lapse of a considerable time in severe cases of aortic or mitral endocarditis a slight affix or prefix to the systolic sounds may begin to appear. But it is much more common for patients to return to the hospital with a second attack of rheumatism, or for some other cause, and to then present evidence of a stenosis at the mitral orifice or an incompetence of the aortic valves which did not exist before.

No doubt in some instances this may be an inevitable occurrence from natural changes of a cicatricial and deforming kind occurring in the new tissue of the valve consequent upon the primary endocarditis. But it is always aggravated by, and often entirely due to, premature strain upon valves softened and impaired by inflammatory change.

The infrequency with which aortic regurgitation and mitral stenosis are met with in primary cases of rheu-

matic fever cannot fail to have impressed clinical observers, but the lesson to be received from this fact has not been duly learned.

Dr. Sibson* points out that of 24 cases of acute rheumatism with primary endocarditis treated by a rigid system of rest, only one gave evidence of aortic as well as mitral disease, whereas in 19 instances out of 127, or one in 6·7 cases, not so rigidly treated in this respect aortic regurgitation was present. But even Dr. Sibson did not point the lesson, for he only insisted upon the importance of maintaining rest for "a period of several days after the complete disappearance of the local inflammation of the joints."

If it be true that aortic regurgitation and mitral stenosis, rarely met with in primary rheumatism, are the results of secondary changes in the valves caused by (1) strain upon the softened valves, and (2) by cicatricial deforming changes in them; the first of these can be to a great extent prevented and the second to a great extent lessened and modified by maintaining the patient quiescent for a sufficient length of time.

The exigencies of hospital routine, the pressure of perhaps more urgent cases, and the natural anxiety of the patients themselves to get home, result in the discharge of rheumatic fever cases, even with heart complications, within a month or five weeks, when perhaps another month's rest would add many years to the

* *Ibid.*, vol. iv., p. 384.

life estimate. A very bad lesson is thus taught to students.

In private practice, in dealing with children and young people especially (and they are numerically by far the most important cases), it is not difficult with sufficient firmness in explaining the position to secure an adequate period of rest to allow of a complete subsidence of inflammatory change and a restoration of due resisting power in the weakened valve.

At least two months after an attack of rheumatism involving the heart, and in some severe cases, from four to six months are necessary for this purpose.

A minute attention to the temperature chart and pulse and careful investigation of the cardiac sounds will be the chief guides in regulating the rest treatment of these cases. For a further ill-defined period of months very gradual and careful return to an amount of activity suitable to the case must be permitted.

Under this system of management very striking results—in many instances practically complete cure—will be obtained, especially in children and young people. It was taught in my student times by the greatest of living clinical teachers that children grew into rather than out of heart disease. I have been surprised since to meet with many instances to the contrary, and I venture to think that the opinion was based largely upon the experience of the Children's Hospital, dealing with poor children who were not maintained long enough at rest and who returned later with the results of the deforming endocarditis.

It would be tedious were I to do more than mention that in the subject of a severe peri- or myocarditis allowed to move about too soon, the softened heart walls yield and the fibro-nuclear changes proceeding tend to render such yielding permanent.

I have restricted my remarks so far to rheumatic cases since they constitute the vast majority, if not all, of the cases that occur and at least of those that are under our control, and such other cases as may be met with from acute overstrain, scarlet fever, or other fevers would fall under the same lines of treatment.

I have pointed out that the cardiac group of drugs is of little value in the early stages of heart disease. Our object is to promote resolution and the healing process. Our primary object is not at this stage to increase heart power, which would, indeed, only antagonise our views of easing valve function.

As the acute rheumatic features fade, general anæmia and cardiac fatigue often present themselves for consideration in treatment, and such drugs as arsenic, strychnine and iron are strongly indicated.

At this stage, particularly in pericardial and in some endocardial cases, the employment of moderate doses of iodide—*e.g.*, a five-grain dose of combined iodides of soda, ammonia, and potash—three times a day have seemed to me to be of some advantage in helping the resolution of the inflammatory thickenings. A due regard would, however, be paid to the toleration of the iodide and it would in all cases be combined with some tonic, such as strychnia, arsenic, or iron.

It is at this time, at the end of the pyrexial interval, that the question as to the usefulness of digitalis comes in. A quickened and irregular rhythm, one or both arising from want of power to deal with a valve defect, is the particular indication for the employment of digitalis. The drug is of little, if any use, and may do harm if the quickened action be the result of inflammatory irritation. Hence, where the irregularity is attributable to peri- or myocarditis the drug is useless; when the soft low pitched murmurs with raised temperature indicate active changes going on in the valves, digitalis should be withheld unless positively demanded by a failing ventricle, the special signs of which would be congestion of the lungs, enlarging liver, œdema of the limbs and very scanty urine. But these symptoms are only present in very grave cases. In the majority of instances during active valve changes, as I have said, digitalis is not needed. In some cases when the patient begins to get about it may be necessary to combine for a time moderate doses of digitalis with the general tonic in order to maintain the tone of the newly acquired hypertrophy commensurate with the valve defect.

In the selection of change of air for convalescent cases of endocarditis the first consideration is freedom from wetness of subsoil. Seaside towns are generally preferable to country districts on account of the ground being well-drained, the walks easy, the sunshine abundant, and facilities in the way of bath-chair exercise, sunny balconies, &c., greater.

I may here mention a matter of extreme importance to which I shall allude again in speaking of ulcerative endocarditis, and that is the necessity of perfect sanitation bearing in mind the susceptibility of the recently inflamed valves to bacterial invasion.

In cases in which the lesions are grave, the progress tedious, and the necessity for rest prolonged, general nutrition may be maintained by judicious massage such as to stimulate muscle nutrition and facilitate venous circulation. Thus do they become better prepared for gentle forms of exercise on first getting up; these exercises may be taken in some definite and prescribed form as at a spa, or they may be simply directed by the knowledge and common sense of the doctor.

On being consulted about a case of valvular heart disease the physician has, of course, first to make an accurate diagnosis, not only as to the particular valve defect in the heart, for in that a diligent fourth-year student could equal the most experienced, but to form a just estimate of all the conditions present and to decide what are the essential factors in the diseased state, and in what symptoms or group of symptoms the objective for treatment is to be found.

Secondly, having arrived at this point the physician's further deliberations mainly turn upon whether *(a)* the case is a suitable one for the employment of remedies of the digitalis order and to what extent they shall be pushed; *(b)* does the case require complete rest? or *(c)* what degree and kind of exercise will be beneficial or may be permitted? and *(d)* the general state of the

patient, his nervous system, condition of nutrition, blood state, &c., will have to be considered as well as those special functions of kidney and liver and the dropsical state which are a part of the perturbed circulatory condition.

It is of course quite unnecessary for me here to discuss any points of physical diagnosis and I will at once pass on to a brief consideration of the properties of digitalis upon which we have to rely in practical therapeutics.

There is no drug so familiar to us as digitalis and there is no one drug which has added so many years to the sum of human life. It may also be said that the difference between the effects upon the heart of digitalis in skilful and unskilful hands is as great as the difference in the effect of the curb rein on a restive horse under the same circumstances.

And although most that one can say about the drug and about the small group which it represents is but trite and commonplace, and must especially appear so to so experienced an audience as I now address, there are one or two points about the action of the drug an imperfect knowledge of which for the moment rather embarrasses than strengthens the hands of the practitioner in its use.

What are the attributes of digitalis upon which we rely in our daily practice?

1. Digitalis slows the heart's action concentrating the force expended upon fewer and more efficient contractions.

2. It is stated that digitalis also directly stimulates the heart's action (Williams).* The more obvious effect clinically is rather a concentration of force and gathering of small, irregular beats into efficient contractions.

3. It is generally agreed that the drug affects the cardio-vascular muscles directly. Although the ultimate plasmic distribution of the vagus in the heart is presumably the special sphere of its influence it is highly probable that its effects extend also to the nerve centres. It is difficult otherwise to explain the secondary effects of digitalis, especially its vaso-motor effects and the peculiar nausea, resembling that of sea-sickness, which often proves so important a result of its continued use.

4. Digitalis contracts the arterioles and this effect, in combination with the increase in the contractile force of the heart, raises the blood-pressure in the arteries.

5. The effect of the contraction of the arterioles is to maintain the blood-pressure between the cardiac beats. This effect of digitalis in contracting the arterioles has been known for thirty years, and as Dr. Lauder Brunton† was among the first to experimentally prove it, so he has by a series of experiments made with Dr. Tunnicliffe‡ quite recently maintained the importance

* Quoted with acceptance by Lauder Brunton, *Journal of Physiology*, vol. xx., 1896, p. 357.

† Lauder Brunton and A. B. Meyer, *Journal of Anatomy and Physiology*, vol. vii., p. 134.

‡ Lauder Brunton and F. W. Tunnicliffe, *Journal of Physiology*, 1896, vol. xx., p. 354.

of arteriole contraction in sustaining the blood-pressure between the beats of the heart.

Some timidity has arisen in the use of the drug lest by increasing arterial resistance and at the same time stimulating ventricle action it should lead to cardiac overstrain and exhaustion.

The possible occurrence of such strain and the detrimental effects arising from it, must, of course, be taken into consideration in prescribing digitalis in certain cardiac conditions, but its action on the vessels is really one of the most valuable attributes of the drug supplementary to its cardiac effect.

It must be remembered, as shown in both series of Dr. Brunton's admirable experiments, that the blood-pressure is maintained in the arteries in the intervals of systole; that is to say, that under digitalis influence after closure of the aortic valves the aortic resilience more gradually effects the emptying of the arteries through the capillaries. Now this effect is of great clinical importance.

1. It maintains the blood longer in the arteries and hence favours the more effectual irrigation of organs, particularly of the secreting organs.

2. By the better distribution of the ventricle force venous congestion is avoided and the venous current more sustained, the heart has less immediately to overcome venous inertia, and the less bulky and stagnant venous stream is more readily respondent to *vis a fronte* influences.

3. Provided always, however, that corresponding

with a longer maintained arterial pressure the digitalis produces a slower heart beat. For it is obvious that if with increased slowness of distribution of cardiac force we have no corresponding diminution in frequency of the cardiac contractions we may get the resistance mounting up to a dangerous pitch.

From clinical observations I should have said that in medicinal doses digitalis affects the heart before the vessels, and so the proportionate conditions of its effective and beneficial action are in suitable cases secured, although experimentally with the drug introduced directly into the circulation in full physiological doses the vessels have been found to react sooner than the heart.

4. Pushed beyond its therapeutic limits digitalis appears to paralyse the cardiac vagus, the heart's action becomes rapid, peristaltic and finally stops in systole. The failure in heart power seems to arise from inefficient and finally extinguished diastole and the arterioles generally maintain their contraction to the end.

In considering the cases of cardiac disease, and for the moment speaking of valvular disease of the heart, the first thing to remark is that there are to be observed a type of pulse and heart rhythm, adapted to, and characteristic of, each form of valvular disease of the heart which may be regarded as normal to that lesion, and it should be the object of the physician to consider whether the rhythm of beat and the result of

estimated cardiac force as registered by the pulse are in full accord with the altered circumstances produced by the valve defect.

How far the pulse varies from that of health is a preliminary part of the diagnosis, the question for treatment is whether the character of the pulse is normal to the lesion found, or does it vary from what it ought to be under the circumstances, and to what is the variation due.

On thinking the matter over in this light we perceive that in the therapeutics of cardiac affections after the acute stage we do not treat the valve defect, but we treat the heart, whilst it will be remembered that in thinking over the treatment of cardiac affections in the acute stage we found that our measures were not directed to the heart so much as to the affected valves or pericardium; we found in fact but little employment for drugs of the digitalis order in acute cardiac affections, and that in many cases their employment was positively to be avoided.

There has been much dispute as to whether digitalis —and in mentioning digitalis I speak for the whole therapeutic group—should be used in the treatment of aortic regurgitation. Now in the most typical cases of aortic regurgitation the patients are very well, they may be quite unconscious that they have anything the matter with them, they lead active, even athletic, lives and will be shocked, on presenting themselves before an insurance society, at being refused or very greatly surcharged.

Except for accidents in the way of functional disturbances of reflex origin, vaso-motor angina, to which they are very liable, and sudden or gradual overstrain, to which their unguided energies tend to lead them, these patients, if they follow rationally prescribed lines of conduct, may go on very well until the degeneration period of life.

They may, like other people, require a tonic from time to time, but so long as they present the most characteristic marks of their special lesion they do not require digitalis.

Now the conditions of good compensation are steady, regular, forcible ventricle beats—an increase in the capacity of the left ventricle to accommodate a larger measure of blood in diastole and a vigorous and truly muscular hypertrophy to enable the ventricle with little supplementary support from the aortic valves to propel the blood through the capillaries and maintain the venous current.

Under these conditions, which are faithfully recorded in the steady, regular pulse, with a strong, abrupt beat, rapid subsidence and low tension of artery, digitalis is not wanted and a powerful drug when there is no indication for it cannot but be harmful. In all cases, however, of aortic regurgitation which are not interrupted in mid-career by some of the accidents to which I have alluded the time comes when the employment of digitalis is of the greatest value.

What are the indications for its use? In one word, they are the symptoms of commencing failure of the

left ventricle fully to respond to the heavy call upon it, provided that failure be under conditions otherwise normal to the disease.

It may be, for instance, that the ventricle is temporarily overburdened by the results of some nervous, dyspeptic, or gouty storm reflected upon the small vessels and causing a measure of high tension to supervene upon that relaxed condition of the arterial system which is normal to aortic regurgitation and which is probably a natural compensatory effect, induced by the relaxing influence of the depressor nerve in response to the increased pressure within the ventricle. Under the conditions of high arterial tension thus induced it would be very faulty practice to give digitalis; any result it might have in forcing increased work out of the already willing muscle would be necessarily at the expense of later exhaustion.

Obviously under these conditions a mercurial and saline or such other treatment as may especially meet the cause of the increased arterial resistance is the first measure in combination with a little extra quietude and to be followed by a tonic calculated to restore the fatigued heart. I have already dealt with the treatment of acute high tension accompanied by anginal symptoms in aortic disease.

It has been said that the heart in aortic regurgitation is sometimes too vigorous, its hypertrophy excessive, and that it is necessary to use drugs of the aconite order to lessen ventricular expenditure. I confess I have never recognised a case of the kind and

that in my experience unduly laboured heart's action in this disease is always to be explained by reflected functional disturbance or increased arterial resistance.

The one thing we have to look to in aortic regurgitation is the maintenance of heart power, and any sign of over struggle is rather to be met by measures calculated to diminish peripheral resistance. (1) Irregularity in the heart's action. (2) A want of precision and sharpness in the character of the pulse. (3) Increased displacement of the apex beat to the left, and extended impulse upwards. (4) The occurrence of irregular smaller beats as marked in the pulse and appreciated at the heart. (5) The supervention of a soft systolic bruit over the mitral area. (6) Extension of the cardiac dulness to the right; and finally, (7) The almost complete replacement of the regular, strong, slow, collapsing pulse and simple hypertrophic heart's action, normal to aortic regurgitation by a rapid heart's action irregular in force and frequency, with a corresponding small pulse, having the characters of mitral rather than of aortic disease—such are in gradation the ingravescent signs of ventricle failure in aortic regurgitant disease and the increasingly imperative indications for the employment of digitalis in its treatment.

As the above signs develop we observe important symptoms of the changed arena of struggle from the left to the right heart territories of the circulation. Congestion râles appear at the bases of the lungs, fulness to enlargement of the liver, œdema of the extremities, and scantiness of the urine.

There is no doubt that the symptomatology of failing heart in aortic regurgitation concentres round the fact that with a yielding ventricle systole becomes incomplete and an increasing amount of residual blood is left behind necessitating presently a supplementary intermediate contraction, until finally little better than a disordered cardiac peristalsis ensues incapable of maintaining due arterial pressure, the blood gathers on the venous side, and the right ventricle embarrassed by the counter blast through the relaxed mitral orifice and unassisted by any aspiratory influence on the part of the left ventricle in its turn begins to fail.

The peculiar effects of digitalis under these conditions are precisely called for to slow the action of the heart, to render its contractions more complete and regular, and thus to check the gathering of residual blood in the ventricle and restore the efficient application of the mitral flaps by approximating their attachments.

I have before remarked that clinically digitalis appears to influence the heart before the vessels. There is, indeed, in all probability proportionate relationship between its effects upon these two sections of the circulation.

If as we believe the drug acts directly upon the cardio-vascular muscle we may safely infer that the bulk of the muscle concentred in the heart being more than equal to that of the muscle distributed in the vessels the predominant effect should remain with the heart.

We must not, of course, push this argument too far,

but in carefully graduated doses we may observe that digitalis rarely affects the vessels prematurely or disproportionately in aortic regurgitant heart failure; on the contrary by improving arterial tone it does no more than prevent that rapid emptying of the arteries, which requires a corresponding rapidity or suddenness of ventricle contraction in order to maintain an arterial pressure sufficient for vital functions which is very exhausting to the enervated and failing hearts under consideration.

The maintenance of a strict recumbency is of course essential in the grave cases I have described and with a suitable dietary the heart soon begins to respond to a steady daily administration of from thirty to ninety or more minims of tincture of digitalis or an equivalent preparation, with proper adjuncts in the form of an occasional mercurial and saline.

With the increasing efficiency of the *vis a tergo* the blood-pressure in the arteries rises and with the similarly increased efficiency of the *vis a fronte*—for the drug not only indirectly helps but directly stimulates the right heart as the left—the venous current is hastened, the pulse will begin to steady, and at about the third day the urine will increase in quantity, the signs of venous congestion begin to diminish, the pulse to assume more and more its proper aortic characters, and the patient gradually recovers to a point short, however, of that degree of health and heart-power he before enjoyed.

Thus again and even again have we most of us seen

patients with heart failure in aortic regurgitation restored, put on their legs by the action of digitalis. Having once passed through this ordeal they can never be said to be entirely independent of the drug.

I have put the extreme case, but it is needless to say that by watchfulness in recognising the earlier phenomena of heart failure, which I enumerated as nearly as possible in chronological order, and by the timely employment of an occasional course of digitalis, the more desperate symptoms may be long postponed.

One of the greatest difficulties in practical medicine is to decide when to omit treatment, and this difficulty is particularly felt by many in regard to digitalis. I shall allude perhaps more fittingly to this point later, and will content myself now with the remark that the general condition of the patient, his anæmia or otherwise, his general nerve tone, the due activity of his other functions must be carefully watched and the use of other remedies accordingly employed with a mitigation or suspension as the case requires of the digitalis treatment.

The final word with regard to the treatment of aortic regurgitation would seem then to be—await the distinct indication of altered pulse characters, even ascertain whether there are not general conditions of over-fatigue or strain or impaired general tone from anæmia or other debility before giving digitalis, and having commenced with it pursue the treatment boldly and steadily and look under its influence and as a sign of its success for a return of the characters which are normal in the pulse of this disease.

With regard to aortic stenosis the same argument holds good—that is, that as soon as the normal pulse of this affection—a small, rather slow and regular pulse—becomes replaced by irregularity and frequency, accompanied by the usual signs of failing compensation, digitalis is needed.

Aortic stenosis is, indeed, a rare form of cardiac disease, although the so called aortic constrictive murmur is one of the most common of the morbid sounds of the heart. Any roughening of the orifice, any want of proportion between the orifice and the calibre of the aorta beyond, any undue salience or rigidity of the valves, even with a dilated orifice, will beget a systolic murmur.

I do not think that with regard to the use of digitalis in this affection I have anything more to say. So long as the heart is beating quietly and regularly nothing but harm can come from the use of digitalis, with irregularity and disorder nothing but good, provided it be carefully watched and mitigated with returning regularity.

An important principle underlying the whole question of treatment of cardiac diseases by digitalis is that laid down by the late Dr. Herbert Davies* who, with the coöperation of Professor Haughton established with at least approximate success the proposition that equal volumes of blood are synchronously propelled from the cavities on the two sides of the heart.

* Davies, "The Mechanism of the Circulation through Diseased Hearts," London, 1889, p. 47.

We have seen that in aortic regurgitation a certain degree of dilatation of the left ventricle is normal; this is to accommodate a certain amount of residual blood equivalent to the back flow from the aorta which is an addition to, and has to be returned with, the normal output. When with increasing dilatation this residue accumulates (or if in unpreparedness of the ventricle as when surprised by a sudden injury to the valves it cannot be accommodated) embarrassment telling backwards on the pulmonary side commences.

In mitral stenosis the strain to effect this equilibrium of the two circulations falls upon the right ventricle, which, assisted by the left auricle, has to supply the left ventricle with sufficient blood notwithstanding the narrowed mitral orifice.

In the pure funnel form of mitral stenosis, a disease which is, I am convinced, often of congenital origin, the right ventricle and left auricle undergo corresponding hypertrophy and increase of capacity and are able without artificial aid to maintain the circulation, sometimes for the first forty or five-and-forty years of life.

The features of mitral stenosis are a high pulmonary and a low systemic blood-pressure, a regular, slow pulse, a tendency to pulmonary congestion, and systemic anæmia. Whilst these conditions are maintained digitalis can do no good; the right ventricle is in full work, the left has got scarcely work enough to do, the intra-pulmonary pressure is already near the point of strain, and the prolonged diastolic pause natural to the lesion is precisely

adapted to the needs of the slowly filling left ventricle. Any constriction of the systemic arterioles would be disastrous under such conditions, as was seen in the case I related of mitral stenosis with vaso-motory constriction of vessels and pulmonary hæmorrhage.

The first indication on cardiac distress arising in mitral stenosis would be to relieve the right heart. The venous system should be unloaded by direct venesection or by intestinal and hepatic derivatives combined with a restricted diet and the treatment of pulmonary complications as the urgency of the symptoms might require. But when, these conditions being satisfied, the pulse still remains quick and irregular and the right heart embarrassed, the employment of digitalis is certainly indicated on the same principle as before. And in the presence of cardiac need we may, as a rule, disregard considerations of raised arterial tension, since as I have urged, the first and predominating influence of the drug is upon the heart.

The moment, however, the cardiac action is restored to regularity we must again remember the arterial effects of the drug and, endeavouring to maintain without increasing its effect upon the heart by greatly mitigated doses, to watch for and avoid any undue action on the vessels.

In mitral regurgitation with commencing or established heart failure we find all the conditions calling for the beneficent action of digitalis and the mere presence of a mitral murmur is often regarded as an indication

for the use—it may be the very guarded use—of the drug.

It must be remembered that I am not speaking of acute cases, nor would digitalis be suggested by the mere presence of a mitral regurgitation in the senile heart, of which it is almost a characteristic and often a very advantageous factor. Nor again in those cases in which the regurgitation occurs as a compensatory safeguard in overstrained ventricle from chronic high arterial tension is it often desirable—except with much caution—to prescribe digitalis.

It is in commencing heart failure in chronic mitral lesion from rheumatic endocarditis that digitalis is so valuable. What are the features of this state? A quick, small pulse is normal to mitral regurgitation, and even some irregularity of rhythm or force is of no great moment, although even now short tonic courses of the drug may be useful. But when irregularity is a marked feature, when a few beats are large and turbulent, to be followed by several small beats, when the pulse no longer corresponds in number with the cardiac contractions, when the heart itself shows signs of hypertrophy and extending dilatation of both ventricles with dulness extending upwards over the conus and left auricle, when the neck veins become full, fill from below and pulsate, the liver enlarges, the cellular tissue becomes dropsical, the lungs congested, and the urine scanty:—with these symptoms and signs we have with increasing urgency the conditions calling for digitalis.

These conditions begin, it will be observed, with the pulse and heart characters which replace those which are normal to other forms of cardiac disease when failure is commencing and digitalis is called for. This fact about mitral disease is to be noted in prognosis.

Whilst symptoms of heart failure are earlier in appearance in mitral disease of any gravity they are perhaps longer amenable to treatment, the considerable reserve capacity of the left auricle and the relative shortness of the pulmonary circulation being favourable for a longer struggle against the valve defect, but that struggle begins to be serious at an earlier date.

On the other hand the accidents of mitral disease are fewer than those of any other cardiac disease, sudden death from syncope, angina, or cerebral embolism being common both in aortic regurgitation and mitral stenosis, very rare in mitral regurgitation, but with these two diseases and with aortic stenosis it is—with equal relative gravity—longer before the heart mechanism fails.

A congestion of the pulmonary and venous system and an anæmia of the arterial system are the underlying factors in this condition as in mitral stenosis. But the difference is that in mitral regurgitation the congestion is all backward, each blood thrust of the right ventricle is met by a counterblast from the left, the left auricle is not protected by its valve from invasion backwards, and cannot therefore efficiently coöperate with the right ventricle, and the cusps of the pulmonary valve have to take up in part the function of the mitral valve.

Of course, there are cases and cases of mitral regurgitation, they do not all require digitalis. In some the leakage is so slight as to cause no inconvenience. The skilled practitioner can discriminate to a nicety as to the gravity of the case by the degree with which the first sound is replaced by murmur and by estimating the relation between expenditure of force by the heart, and the result effected in the pulse showing the degree of waste in the mechanism.

I cannot, Sir, but here recall the heroic assiduity of our late Fellow and Vice-President, my illustrious colleague, Sir Richard Quain,* who when mortally ill brought his last work before the Royal Society in an endeavour to explain the much-debated mechanism of the first sound of the heart. Any conclusion arrived at by so acute and thoughtful an observer must command our reverent respect. It is difficult, however, except on the hypothesis that the closure of the mitral valve contributes to the first sound, to explain the great value in diagnosis of the degree of replacement of that sound by murmur as an estimate of the degree of imperfection of the valve and the consequent gravity of the lesion.

The most common mistake that one observes in the use of digitalis is that too large a dose is prescribed at first, which tends to premature arterial contraction and cumulative effects. Then with the appearance of these physiological symptoms the drug is stopped and some other medicine substituted until the pulse again calls

* Sir Richard Quain, *Proc. Roy. Soc.*, 1897 vol. lxi., p. 331.

for its administration. In this haphazard way of using digitalis the heart is never held in good control. It is alternately checked and allowed to run away again.

In exceptional cases, where there is urgent need to push the drug, digitaline is best used subcutaneously. In ordinary cases a dose of 10 minims of the tincture every four hours, or 15 minims every eight hours, or 5 minims every waking hour is sufficient. Thus given, the patient being at rest, it generally takes about three days before the pulse is under control and the urine begins to increase. When its decided effects are thus gradually developed the drug should be steadily continued in doses calculated to maintain them.

With ordinary watchfulness there is no risk whatever, timely warning of excess is given by the pulse, which having become slow begins to exhibit small intermediate beats and especially a tendency to go in couples. This is always a sign to reduce the doses or to omit for a few hours.

The sickness that too often supervenes under treatment with digitalis is most troublesome. An occasional mercurial will sometimes prevent it, a change to digitaline in equivalent doses may be tried, or a tumbler of very hot water taken occasionally. In some cases it is not to be overcome except by omitting the drug; but the patient is usually well under its influence before this symptom appears, and a small dose of digitaline by the mouth or hypodermically may be sufficient to maintain its effects on the heart.

If it be true as maintained in all modern textbooks that the action of digitalis is upon the cardiac muscle and not through the cardiac nerves or their centres, then one can see that a point of coronary impairment or textural muscle change may arise when the heart or that portion of it we may want to influence is no longer amenable to the drug, and practically we find that the time actually comes when attempting to stimulate the heart by digitalis is like to use an Americanism, "whipping a dead horse." But it is also beyond doubt that the heart will sometimes get accustomed to digitalis and will no longer react to it, when a change to one of the allied drugs, *e.g.*, strophanthus will be found useful. Caffein and strychnine act as stimulants through the nervous system.

In over-dosage with digitalis the vagus ends are paralysed, vagus control lost, ventricle cavity diminished and diastolic filling incompleted. The beats become rapid, faulty, peristaltic, and terminate in systolic spasm.

We have always ample warning, if we look for it, of the digitalis being pushed too far :—

1. The rhythm which has become slowed and regulated becomes interspersed with intermediate small beats. This is a sure sign to diminish the daily dose.

2. Arterial contraction becomes excessive. This is a much less sure indication to diminish the drug because in some individuals the vessels are more sensitive to digitalis than in others, and we may often prefer to persevere with its use guarded by minute doses of trinitrine.

3. The urine, which has increased, diminishes with excess of the drug. This may be due to either the effect on the heart, diminishing blood pressure, or on the vessels lessening efficient circulation. In the latter case it will be corrected by remedies of the trinitrine order.

In speaking of digitalis I have regarded that drug as representing the whole therapeutic group. Digitalis is to my mind so far in front of all the others in efficacy that in critical cases I should never think of prescribing any other member of the group before it.

Strophanthus comes next to it in usefulness and in physiological experiment is even more powerful. Clinically one is not so well satisfied with it; this may possibly be prejudice, but I have had doubts about its stability in prescriptions. It causes the same troublesome nausea. The one reason for its use is that it affects the small vessels less; this gives it an advantage in some cases, particularly, perhaps, in carrying on the effects of digitalis in convalescent aortic regurgitation and mitral stenosis cases. But, as I have endeavoured to point out, under most conditions calling for its use this very action upon the arterioles is one of the valuable attributes of digitalis and explains possibly its superiority over strophanthus.

I frequently, however, combine the two drugs when I want to secure an increased cardiac effect without using digitalis in doses large enough to contract the vessels too much.

Convallaria comes next as a cardiac tonic in mild cases, useful for timid women who are terrified at foxglove and arrow poison, but take kindly to the humble lily of the valley. I have only very occasionally used sparteine.

One may observe that the earliest sign of amendment in cardiac failure is an increased flow of urine. This rarely occurs until a perceptible influence has been obtained over the pulse, and it corresponds with an increased fulness of the arterial system, an improved blood-pressure and a lessened venous stasis.

A somewhat analogous relief of the stress of symptoms will often be observed with the commencement of dropsical effusion, provided that effusion of course be limited to the cellular tissue and peritoneum. The peculiar restlessness and discomfort that precedes the onset of dropsy is sometimes very remarkable and the dropsical effusion should rightly be regarded as one of those compromises of nature which enable the vital machinery to go on a little longer.

Dropsy is primarily due to a leakage from the congested capillaries into the cellular tissue. It is also due to a retarded removal of the fluids by the lymphatic vessels. From a therapeutic point of view the osmotic circulation in the cellular tissue and serous and mucous cavities is scarcely less important than the vessel circulation discovered by Harvey.

The interchange between the two circulations amounts normally to many pints in the twenty-four

hours and cellular tissue and lymphatic vessels conduct a considerable share of it. The current of lymph is of extremely low pressure and is a resultant (1) of the difference between the capillary blood-pressure and that in the veins near the heart, (2) being further promoted by contraction of muscles, respiratory aspiration, and contraction of muscular coats of lymphatics. A very slight backward pressure in the veins will embarrass it.

Amongst the conditions favouring dropsy there is not only venous retardation in the capillaries encouraging excessive exudation, but also retarded current in the great veins as a further obstruction to removal by the lymphatic vessels. Thus a considerable collection of fluid, even many pints, may be removed from the circulation by leakage into the cellular tissue, the immediate effect of which is often a very decided relief to the patient's distress.

The occurrence of dropsy may thus sometimes afford time for the readjustment of the circulatory balance in the heart and vessels. But if with the help of remedies this does not take place, if the dropsy advances and it is estimated that the pressure in the cellular tissue becomes great enough to equal or exceed the pressure in the capillaries then interference becomes imperative and the fluid should be removed by the employment of Southey's tubes, incisions or simple punctures with most strict antiseptic precautions. The neglect of such measures will invariably be followed by erythematous or erysipelatous inflammation and more or less cellu-

litis. Very striking instances of long abiding relief are met with from time to time from this treatment.

In some cases dropsy occurs in the absence of heart phenomena which would appear sufficient to produce it. A lady, of about fifty years of age, had been under my observation for some few years for most intense chronic asthma with emphysema and recurrent attacks of bronchitis. Her condition at many times seemed almost hopeless, but the one redeeming feature about her was the heart's action, which remained steady and well sustained through her worst attacks; although there was undoubtedly some dilatation and hypertrophy of the right side of the heart there was no sign of heart failure.

Towards the end of a bad summer in 1896 her legs began to swell and as her distress increased with the cold weather they filled up and by December the thighs and abdominal walls were greatly distended. She was in other respects so ill from her bronchitis and asthma at this time, that I hesitated to tap the legs until they became too prominent a factor in her distress.

Even now, although the heart's action was feeble, it was neither irregular nor very quick and there were no murmurs. She was placed in a chair and by means of four Southey's tubes 20 pints of fluid were withdrawn in the course of 52 hours. Now it is remarkable that there has never been any return of the dropsy although she has not been free from bronchitic attacks; the limbs are perfectly slim and natural, without a trace of

œdema at the present time (August, 1898). The heart's action is as well maintained as before. It only partially failed for a few days after the removal of fluid.

I may say that this patient has never been able to take digitalis or any drug of that series with advantage and it has never been prescribed for her except for short times at rare intervals and in very small doses.

I should regard the retarded venous return from the great emphysema obstructing the lungs, in combination with an over-burdened right heart, as responsible for the dropsy, but the case is one of a few I have seen of the kind, difficult satisfactorily to explain. It is possible that it may be an unusually prominent example of the effect of a mechanism that has more to do with dropsy than has been generally allowed—viz., obstructed venous return in the chest from great emphysema and dilated right heart, retarding lymphatic current and lessening the readiness of its escape into the innominate vein and thus holding in abeyance the share taken by lymphatic absorption in the removal of dropsical fluids.

LECTURE III.

Exercises have been reduced to a system in three grades: massage, the resistance exercises or their equivalent in the mechanical methods introduced by Zander of Stockholm in 1872* and others, and graduated walking exercises of Oertel.

The principal object of massage is to stimulate the arterial circulation in the muscle, to hasten the venous currents, and to promote also the passage of lymph through the lymphatic vessels. The metabolism of the body is thus maintained and secondary, and therefore primary, digestion improved in those who from any cause are unable to take active exercise.

It is at once apparent that we have here a means of helping on the convalescent stage of acute heart affections and of combating the tendency to stagnant circulation in those who are disabled by chronic heart disease.

Still more useful is the treatment in maintaining the circulation and mildly but sufficiently stimulating the coronary circulation in those who, bed- or sofa-ridden from any other cause, on that account tend to impairment of heart nutrition and suffer from chilly extremities, feeble pulse, torpid digestion, and passive congestion of the lungs.

* Groedel: *St. Petersburg Med. Wochenschrift*, No. 13, 1897.

In regard to acute heart affections, it will be gathered from what has already been said that the treatment is not to be advised. Most cases of acute endocarditis occur in young people whose hearts are not disposed to degeneration and whose muscles, although they become weak, recover with a rapidity and develope an energy which has to be restrained rather than encouraged. The heart is always in exercise, the coronaries are in full function, and whilst there is the slightest activity or softness about the valve lesions our object is in no way to excite the heart to increased action. The themometer is our guide and so long as there is any daily rise of temperature all such treatment, unless for some very special reason, should be discouraged.

Resistance exercises, now so well known by the name of Schott* or Nauheim exercises as to require no description, are governed by more complex principles and considerations. By being brought to act successively against regulated resistance every set of muscles in the body can be exercised, and by graduating the degree of resistance and securing a short rest after each set of movements every gradation in the severity of the exercises can be obtained.

Certain special effects are claimed by Dr. Schott and his disciples to be produced upon the heart under almost all forms of disablement and disease by the graduated exercises in combination with aerated brine

* Schott, *Lancet*, May 23rd and 30th, 1891.

baths, but although the effects of these two treatments are a little confused it seems clear that in Dr. Schott's opinion the benefit of the exercises in these cases arise from the following conditions:—

1. The periodical and regulated stimulation of the heart leads to increased action, the muscles of that organ obeying the natural law of the relation between exercise on the one hand and nutrition or growth on the other as surely as do other muscles in which the changes are more apparent to the eye.

2. It is further maintained by Dr. Schott and his coadjutors that contraction of the dilated heart and distinct gain in the force of the pulse, as well as relief of dyspnœa, &c., are clearly observed to be rapidly induced by both baths and gymnastic exercises.

3. Schott, apparently as a later observation, finds that the gymnastic course is capable of inducing the same results as the baths, the heart being stimulated to more complete contraction by reflex stimulation of the cardiac centres through the influence of exercise upon the motor nerves, *i.e.*, similar in effect to the influence of aerated brine water upon the sensory nerves reflecting upon the same centre; and in this opinion Dr. Bezly Thorne* agrees.

Whilst I think no one could for a moment dispute the accuracy of the first proposition, which is, indeed, a matter of everyday knowledge, there do not seem to me to be any sufficiently trustworthy data in support of either of the other two.

* Bezly Thorne, "The Schott Methods of the Treatment of Chronic Diseases of the Heart," 2nd edit., London, 1896.

The occurrence of shrinking of the cardiac area as an immediate effect of the bath or resistance exercises has been denied by very competent observers (Groedel, Guntz, Leyden) and the question of baths and exercises producing their alleged effects by reflex influence upon nerve-centres is still undecided.

4. Dr. G. Oliver has thrown some scientific light upon the effect of exercise in showing by a very simple experiment that the mass of blood in the muscles is thereby increased, so that, *e.g.*, an arm after exercise would displace a larger volume of water than before.

5. Dr. Oliver* has further shown that as a result of muscular exercises the blood thickens, the proportion of corpuscles in a given measure being increased, and he attributes this to the transfer of fluid ingredients from the blood into the substance of the muscles and lymphatic spaces.

6. He quotes Brunton and Tunnicliffe's experiments in confirmation of the previously recognised effect of muscular exercise in first raising and secondly lowering the blood-pressure.

7. It is probably true that the circulation through muscles in action is more rapid and easy (after the first pressure effect of the muscle upon the vessels has passed off) and that the determination of blood to them may relieve the congestion of other organs. It is difficult to see how such replacement of blood should have any special effect in depleting the chambers of

* "Recent Discussion at the British Balneological and Climatological Society." See *The Lancet*, Feb. 5th, 1898.

the heart except by facilitating the general circulation.

8. The effect of resistance exercises in slowing the pulse is not constant and would naturally vary with the degree of exercise and the condition of the circulation beforehand. Walking smartly across a room once or twice will often diminish the rapidity and increase the force for the time of a quickly and weakly acting heart.

The effect of the Nauheim exercises may, then, be said to be a stimulation of the heart's action with some steadying effect and increased completion of systole—an improved circulation through the coronary vessels and an increased mobility of the blood by its readier passage in greater bulk through the muscles, thus relieving stagnation in the great internal organs, especially on their venous side.

In what cases are these exercises to be advised? The employment of the carefully graduated and observed exercises of Schott and Oertel may be regarded as a counsel of perfection to be advised for certain cases only as a preliminary to the return to that measure of active life of which their heart condition admits, and as serving the purpose of indicating what that measure will be and by what degree of ordinary exercise it may be arrived at.

Resistance exercises are especially adapted for the initial treatment of those flabby, irritable, "stuffy" hearts, if I may use the term, as applied to cases of fatty infiltration and impaired metabolism, which are met with in people of venous plethora.

In cases of chlorosis with dilated heart after a preliminary week or two of complete rest the Schott treatment is valuable if combined with a dry, bracing climate and some chalybeate.

In the first commencing failure of heart in chronic valve lesions the treatment may be employed combined with a more or less complete cessation from all other exercises and similarly after such cases have been restored up to a certain point by digitalis treatment.

Further, certain cases in which from the symptoms and signs we recognise the presence of atheromatous change in the coronary vessels, the treatment may be cautiously tried in combination with much rest. These cases are characterised by a certain degree of plethora and by breathlessness, attended with cardiac pain on arriving at a certain stage of walking or inclined walking exercise. If the treatment be mainly confined to these lines it is undoubtedly an aid to our therapeutics.

There are other cases again in which it should not be employed. All cases of acute endocarditis, whilst there is any trace of activity of lesion remaining are still more unsuitable for this than for the massage treatment. Cases of advanced cardio-vascular changes of the nature of sclerosis and particularly when associated with granular kidneys are absolutely unsuited. In cases of introspective people with neurotic hearts, the treatment is best avoided. The numberless cases of imaginary weak hearts that would naturally flock to specified "cures" require a diagnosis and a better

occupation than that of indoor gymnastics. The exercises have in my experience not proved successful in tachycardial cases. For exophthalmic goitre in the early stages they seem eminently unfitted.

A still more pronounced treatment is the Oertel* treatment of graduated walking exercises with a dietary restricted in fluids. A dry, highly nitrogenous diet with avoidance of fats and a very sparing allowance of starch, with fluids restricted to 36 ounces a day all told, and steady walking exercise for distance and steepness of ascents adapted to the condition of the patient. The gentlest incline walks can be arranged with frequent rests or the exercise can be pushed to the point at which deep gasping respirations are excited and a profuse action of the skin is produced.

This treatment is fully described in Ziemssen's Cyclopædia. It has been replaced very much by the Schott exercises, to which, however, it may be regarded as a sequel. The guiding principles and restrictions of its use are sufficiently obvious. Its chief advantage is that it is undertaken in the open air.

There is no doubt that some of the discomfort which ensues from massage and passive exercises, the unexpected sense of fatigue and languor, may often be attributed to want of good air in abundance adapted to the increased oxidation produced.

* Oertel, "Kreislaufs-Störungen," v. Ziemssen's "Handbuch," B. vii., 1884, and B. iv., 1891.

And this leads me to mention another point of great importance in the treatment of impaired hearts, and that is the desirability of the patient's taking full inspirations, especially during the limited open-air exercise allowed to them. The constant aspiration of the elastic lung as an aid to the circulation is scarcely yet appreciated in practical medicine. I endeavoured to emphasise its importance many years ago as a force of constant action even through the whole period of expiration and as increasing with the inspiratory expansion of the lungs.*

I have been in the habit often of advising bedridden people to take an occasional series of deep inspirations with the view of lessening venous stagnation.

Dr. Oliver, in his Croonian Lectures, and quite recently in his remarks at the British Balneological and Climatological Society, has drawn attention to the effects of deep, slow inspirations with firm contraction of the abdominal parietes in emptying the hepatic and other abdominal veins and in increasing splanchnic vaso-motor tone.

All the points which have been noted with respect to formulated exercises are common to other less regulated kinds of exertion of similar degree and severity. The wielding of a salmon rod is a resistance exercise equal to and more amusing than any of those of Nauheim. We should probably find the muscles swell, the blood thicken, the blood-

* "On Some Effects of Lung Elasticity in Health and Disease." *Transactions of the Medico-Chirurgical Society*, vol. lix., 1876.

pressure at first rise and then fall, the venous currents quicken and internal congestion relieved after a similar manner.

Any physiologist might see the same phenomena on a milder scale when observing the enthusiastic golfer with his whole mind occupied and his every muscle braced and restrained in accomplishing some delicate stroke of the game.

The "sense of strength" in billiards is only another still more delicate balance of muscular work.

We have since the beginning of the world been undergoing in our sports and pastimes resistance exercises—every one set of muscles checked and regulated by the opposing muscles. But exercises have not been organised in any graduated scale calculated to be beneficial and not harmful for those whose hearts are weak or partially disabled. Hence, although we have many of us seen for years past, perhaps, since the teachings of Stokes sank into the professional mind, the beneficial effects of well-advised and guarded exercise in cases of heart disease, it is nevertheless certain that we have learned from the advocacy of elaborate exercises by Oertel* and Schott† and by Dr. Thorne‡ in this country, a greater confidence in their use from a more precise knowledge of their effects.

Exercises of most varied kinds can be devised suitable to all degrees of cases in which any exercise at all is desirable. Level walks with frequent pauses,

* Oertel, *loc. cit.* † Schott, *loc. cit.* ‡ Thorne, *loc. cit.*

similarly taken inclined walks combined with a numbered succession of deep inspirations, golf, croquet, cricket, fishing, shooting, tennis, cycling and such-like sports taken in the open air can be graduated with considerable nicety, and are certainly as a rule to be preferred to mere gymnastics within doors.

Formerly weak-hearted people were not allowed to move; now they are made to walk. The swing of the pendulum is tending, perhaps too much, towards exercise. Schott, in his paper to *The Lancet* in 1891,* with the exception of aggravated cases beyond the reach of any treatment, allows only two conditions of heart to contra-indicate the treatment by baths and resistance exercise—viz., aneurysm and progressive arterio-sclerosis, and not all cases of the latter.

One has witnessed many an apparent triumph of quickly restored strength and apparent well-being in young people with acute endocarditis who have been too soon allowed to resume their exercises. It is only in the latter months that the effects of the chronic deforming lesion of the strained softened valve are manifested.

The strong brine and aerated baths of Nauheim and other places are unquestionably of much service in some circulatory disorders. They are perhaps most suitable for cases of chronic rheumatism and gout associated with high arterial tension and secondary cardiac disturbance.

* *The Lancet*, May 23rd and 30th, 1891.

In cases of functional excitement of the heart's action in connection with quiescent or only imperfectly compensated valvular affections they may be used. In the latter cases at first in combination with more or less complete rest, then with graduated exercises.

In the high tension and less quiescent cases the higher temperature, calculated to lower tension and to stimulate surface circulation, is the more useful.

In the more neurotic cases with sound hearts the more tonic and comparatively lower temperatures may be employed of shortened duration.

It is well pointed out by Dr. Groedel that the baths and exercises are two separate therapeutic agents and that in perhaps only twenty per cent. of the cases are they usefully employed in combination, although massage may be more frequently employed. Beneke*, who originated the bath treatment at Nauheim, was very sound in his doctrine to avoid all gymnastic exercises until after the lapse of six months from any acute endocarditis.

We now come to the treatment of acute heart failure which may perhaps be best referred to in connection with that acute disease in which it is frequently met and of which it too often forms the fatal turning point —viz., pneumonia, in which disease the invalidating conditions affecting the heart are (1) stress of labour; (2) blood-supply and nutrition impoverished and vitiated; and (3) innervation excited and debilitated by the effects of shock and pyrexia.

* Beneke, *Berlin Klin. Wochenschrift*, No. 22, 1870

How are we to meet, and it may be to anticipate, heart failure under these circumstances? This is really the kernel of the problem before the physician in every case of severe pneumonia.

All rational treatment of the early stages of pneumonia tends to lessen the blood-pressure in the lungs. It is in the latter stages, towards the crisis, when the lungs are most extensively consolidated, when the nervous excitement of early pyrexia is yielding to exhaustion, and when the blood aeration is most defective, that acute heart failure is apt to supervene. A running pulse, irregular from loss of vagus control, is the first symptom, soon to be followed by œdema of the unconsolidated portions of the lungs frothing up through the bronchial tract to produce that ominous tracheal rattle with which we are too familiar; these are the signs of heart failure threatening life.

There can be little doubt that an exhausted nerve centre is at the root of most of the cases of cardiac failure rather than mere overstrain from impeded pulmonary circulation. There are two symptoms which especially tend to heart failure and are largely instrumental in causing the nerve exhaustion which brings it about—viz., a temperature above 104° F. and sleeplessness.

It will be generally noted that the failure comes on suddenly; there may have been one or two preliminary warnings of partial collapse with running pulse and cold extremities from which the patient may rally but which are generally followed by more severe and often fatal attacks. At the very commencement of such

signs ammonia, which my experience would lead me to infer after a few days of usefulness tends rather to produce cardiac depression, should be changed for a mineral acid of which dilute phosphoric acid is the best. Some digitalis or strophanthus should be added to the mixture and strychnine should be given separately either in an extra quantity of stimulant or subcutaneously if the absorbing powers of the patient are at all doubtful.

But the most powerful remedial agent is oxygen, since it attacks one of the chief causes of cardiac failure by securing a supply of oxygenated blood to the coronary vessels and the pulse will be observed to become slower and fuller under its influence. It should be at hand in all severe cases and should be given in good time as an occasional inhalation.

Whilst as a rule we need not in pneumonia attach much importance to a high temperature, in any case where heart failure threatens it must be reduced to a safer level—*i.e.*, by a degree or two—by hot or cold sponging or, if necessary, by the dripping cold pack.

Another question presses at about this time; it is that of sleep. Most cases of pneumonia get frequent short snatches of "dog sleep," which is all that we can expect and serves to tide them on to the crisis; but who has not witnessed that wide-eyed delirious vigil in pneumonia, and especially in influenzal pneumonia, in which the mind is painfully alert and the senses preternaturally acute, sleep being entirely absent?

I am in the habit of suggesting help for wakefulness

in pneumonia in the form of a small dose of 10 gr. or 20 gr. of sulphonal taken in hot fluid at 8 or 9 P.M., and with this preliminary a 20 gr. dose of bromide taken at 10.30 is often sufficient to secure some restful sleep. When the temperature is high a single dose of from 7 to 10 gr. of phenacetin may be added to the bromide. When delirium is a marked feature hyoscin in doses of $\frac{1}{200}$ gr. subcutaneously and repeated once or twice may be used sometimes with great advantage.

Cases of persistent sleeplessness almost invariably prove fatal with heart failure, a running pulse, the cardiac action becoming at last merely peristaltic as the blood-clot accumulates in the auricles. Bromides, chloral, sulphonal, are almost useless and with the gathering serum in the tubes one hesitates to give opiates. And yet I believe that in these severe cases morphia should be given to secure a few hours' sleep and to give the nervous system time to recuperate and to allow of some restoration of heart power before it is too late.

I have seen some cases in which death has appeared to be adverted by (1) a strong dose of food and stimulant; (2) $\frac{1}{3}$ gr. of morphia with atropine; (3) aeration being maintained by the oxygen current being frequently played over the mouth and nostrils for a few minutes at a time. The oxygen may be warmed as it enters the bag by passing it through a coil of tubing immersed in hot water.

It has seemed to me that strychnine has rather favoured this peculiar sleeplessness of patients when

utterly exhausted, but its powers as a cardiac stimulant is unrivalled and its use in cases severe enough to lead up to this condition is quite essential and it may be renewed on the effects of morphia passing.

The remarks I have just made are applicable to heart failure in pneumonia and I have endeavoured to indicate the measures that tend to advert it and to combat it when present. I have not dealt with the treatment of pneumonia in any other sense, for to treat the vast majority of cases of pneumonia with alcohol, strychnine, oxygen, morphia and the like would be at best like storming a mud hut with Armstrong guns; to use dangerous remedies in cases which require only the gentlest treatment and careful nursing is a great blunder.

The fatigue of heart that follows such tempestuous periods is sometimes very great. It is partly nerve fatigue and is associated with an often greatly depressed temperature lasting for many days. It is in part also muscular fatigue. The pulse either remains quick and very soft or it may become very slow and vacillating.

Patients should always remain in bed until the temperature, which after the crisis frequently descends considerably below the normal, has had at least a sufficient interval to return to or near the normal range, and cardiac and nerve tonics such as strychnine, caffein, and the hypophosphites will prove valuable on convalescence.

Exercise in these cases must be cautiously resumed, keeping well within the limits of fatigue until heart power is quite restored.

Acute heart failure in other diseases and from other causes requires a similar handling, varied to meet varieties in the case. Time will not permit me to allude to them further.

I should like, however, to draw attention to the great value of oxygen inhalations in the treatment of heart failure in old people, due to fatty degeneration of the organ.

These cases are characterised by the usual signs of a rather large and feebly acting heart, together with irregularity of rhythm, there being perhaps twenty or thirty beats fairly reaching the wrist, whilst amongst them are twice as many beats which only very imperfectly do so. Cheyne-Stokes breathing is another remarkable symptom which is especially apt to supervene after any fatigue and to come on during sleep. This form of breathing bears no direct relationship to the pulse and is probably an associated degenerative neurosis.

The employment of oxygen inhalations several times in the twenty-four hours has a decidedly strengthening influence upon the heart, no doubt by sending some extra-oxygenated blood through the coronary arteries, and it also lessens the Cheyne-Stokes breathing and refreshes the patient. Strychnia is the most useful cardiac stimulant in these cases.

Coming to that large class of sub-acute or chronic heart failure dependent upon degeneration or other changes in the heart wall, we find them separable for the purposes of treatment into those in which the

impairment is temporary and remediable, as from (1) anæmia; (2) fatty infiltration; and (3) overstrain; and into those in which it is permanent as in (1) fatty or fibro-fatty change from coronary disease; (2) chronic fibroid change from other causes, syphilis, alcoholism, or associated with chronic high arterial pressure in gout, renal disease, &c.; and (3) senile changes.

In anæmia the atonic and badly nourished heart frequently yields before the blood-pressure, is slightly enlarged, irritable in function, and besides the usual hæmic bruits presents a murmur at the mitral area. Such cases are frequent in hospital practice, and it may be said that the routine treatment of cases of chlorosis bad enough to come into hospital is a fortnight's rest in bed, with the necessary laxatives and ferruginous tonics and further treatment at a convalescent hospital.

The heart is capable of being severely taxed, provided it be a healthy organ in a fairly young subject, without being overstrained, the difference being that between functional fatigues and actual damage to valve or muscular wall. Of course too frequently repeated over-taxation will cause permanent enlargement with some change in the muscular texture not only of the heart but also of the vessels.

Case.—A naval officer, aged 48, consulted me recently on account of his being sensible of his heart's action, especially when lying on the left side. He was accustomed in early life to run quarter mile races and whenever he left his ship he always indulged in hard sports especially polo. Twelve months ago in

Australia, after a hard game at polo, he was exhausted and felt faint and shaky the next day. On examination he presented a moderate degree of hypertrophy of the left ventricle, the apex beat being somewhat thrusting just within the nipple line, and the impulse too diffused inwards towards the sternum. The pulse was 80 and regular and compressible, but the radial vessel was large and somewhat thickened and wanting in elasticity. Here was a case of cardio-vessel change consequent upon repeated over-taxation of the circulation sometimes when not in good condition owing to confinement on board ship. The present condition, a permanent one, is compatible with a life of moderate activity, but further straining efforts would be likely to lead to aneurysm or grave valve lesion.

It is, however, prolonged taxation of the heart extending over the period of fatigue that is very apt to cause changes of a more or less permanent kind which constitutes overstrain. The irritable heart of soldiers described by Da Costa, and the forms of heart disease found so frequently in lightermen and professional athletes, are of this source.

It is extremely important that in young people undergoing active growth and development sports should be so arranged as not habitually to tax the heart and circulation beyond the period of fatigue, the point to be remembered being that young people can do almost anything in short spells or spurts with rest between, but their hearts will not bear with advantage prolonged and fatiguing exertion, the reason being that

nutrition changes of waste and restoration are quick and cardiac innervation excitable.

In full-grown adult life great exertion can be more prolonged and as life advances the heart is much more liable to damage from quick spurts of effort than from prolonged and steady exertion.

In my belief with perhaps the single exception that in some cases long runs and paper-chases are not sufficiently supervised with regard to the varied ages and physique of the boys the usual public school sports are admirably adapted for them.*

I would here make an observation which is probably in accord with the experience of others, although I have not seen it alluded to—viz., that in young people, especially boys between seven and twelve years of age,

* The medical officer to one of our great public schools writes to me:—"I enclose you a list of our runs. Up to two years ago the *same* runs were run by boys of 13 and 19 years of age, with these occasional results—vomiting on the road; vomiting in the evening after a run; lying on the road exhausted; and in one instance a fatal termination.

"Under our present regime, which it has taken 25 years of persistent advocacy to establish, no ill effects ever arise, and boys are keen to join in the runs; whereas formerly the small boys would try to evade them in every conceivable way.

"A. *Twelve miles.*

"Exclusively for boys above 17 years of age with leave obtained from home and House Master, and whose names are placed on a special list. Every boy who runs to be in good training.

"B. *About nine miles.*

"For boys above 16, with leave from home and special leave from House Master.

"C. *House runs—seven and five miles.*

"No time limit. To be run separately by senior (7 miles) and

it is common to find the heart relatively large, the apex beat slightly outside the normal, the impulse of the left ventricle relatively strong. I believe this condition to be by no means abnormal and that it is attributable to the restless activity of early youth and to the cardiac development being somewhat ahead of the pulmonary. It would be an error to regard it as morbid.

As an instance of what I mean by over-taxation of the heart in young people which would lead to over-strain, I may quote the following case.

I was a short time ago consulted about a fine, high-spirited little lad, aged fourteen years, well-built, full of courage, and who had been a successful competitor in most school sports. These had probably done him no harm. But in the holidays he was allowed to associate in sports with older people. He would do bicycle races with his elder brothers; he would go out for whole long autumn days shooting with grown up sportsmen; in fact, he pursued to extreme fatigue sports for which he was unfitted, and the result was a degree of hypertrophy and dilatation of the heart which caused him to be refused for the public service and he was then brought to me for an opinion.

junior (5 miles), each run being in charge of at least two responsible persons.

"D. *Little side runs. Distance* 3 *to* 3½ *miles.*

"Time one hour. Not more than three hundred yards to be run at a stretch, with slow walks between each.

"No boy may under any circumstances join in a run of a class superior to the number against his name."

Whilst the youthful heart soon recovers, a degree of stress of work that calls forth full reserve powers and some temporary enlargement, it is when the quick waste of youthful tissues is forgotten and efforts are allowed to be too prolonged or too quickly repeated without sufficient intervals for rest and repair that harm may arise. A full training involves a certain amount of hypertrophy and dilatation up to physiological limits of reserve capacity. We want to know more about the phenomena of involution in such hearts on the cessation of effort and training after the event has come off, and some of our members at the Universities, or who have opportunities of watching athletic training elsewhere might collect for us some valuable information.

My own limited experience of those who have overdone it in training is that they become anæmic, that their cardiac innervation suffers and that the ventricles yield from impairment of muscular nutrition. An anæmic condition of such patients and an occasional hesitation in the cardiac rhythm are the earliest phenomena.

The treatment of an overtaxed heart and the lighter degrees of overstrain is simply a short period of complete rest followed by steady but carefully graduated exercise, calculated to maintain cardiac and general muscular circulation and nutrition without exciting the heart's action or increasing the blood pressure.

I think special heart exercises are better avoided: we do not want to make heart "crocks" of our young people. Children have great powers for complete recovery in their rapid renewal of tissue.

Overstrain of unsound hearts is, of course, a matter of daily experience, and is the immediate cause which brings such cases under observation. Its treatment is involved in that of the heart disease upon which it supervenes and the same remark applies to the more severe effects of strain such as rupture of valves, aneurysms, and the like.

The time remaining at my disposal may perhaps with greatest interest be devoted to a consideration of *Infective Endocarditis*, the true significance of which was, as is well known, first recognised by the late Dr. Senhouse Kirkes in 1853. He was followed by Virchow, who with you yourself, Sir, in the pages of that mine of pathological wealth, the Guy's Hospital Reports,* were amongst the pioneers of modern clinical medicine who recognised the essential characters of the disease.

Its pathology will be broadly covered for our present purpose by saying (1) that it is a disease most commonly (61 cases out of 69 *Coupland*) supervening upon valve changes the result of former endocarditis; (2) that it is produced by the lodgment and local cultivation of microbes; (3) that its secondary results are occasioned by the toxins yielded to the blood by these organisms and by the detachment of microbe bearing fibrinous emboli occluding vessels in various organs and parts; (4) that the organisms regarded as capable of setting up infective endocarditis are of more than one kind,†

* "Guy's Hospital Reports," 1870, vol. xv., p. 33.

† Dr. Dreschfeld (Allbutt's "System of Medicine," vol. i., p. 629) enumerates twelve kinds of organisms as having been found.

but that streptococci and staphylococci pyogenes are the most frequently found, pneumococci next in frequency, gonococci and others being occasionally met with ; (5) it is stated that in some cases organisms have been found peculiar to the lesions.

The disease is frequently started from infection through septic surfaces or centres, endometritis, otitis, gonorrhœa, intestinal or faucial sloughings, &c.

In other and a numerous class of cases the disease arises without any intermediate illness from exposure to sewer-gas emanations, but in the latter cases in my experience it has almost always happened that previous valve lesions from former endocarditis have existed.

I have only met with one instance in which the infective disease has supervened in continuity upon acute rheumatic endocarditis, and this case was complicated quite in the early period of the rheumatic endocarditis by a left apex pneumonia, pointing to a possible source of the infection. But this does not seem to be the experience of others and one would regard such cases as very possible, given acute rheumatic endocarditis in the presence of insanitary surroundings. It is a curious instance of that fallaciousness of experience which is so aptly alluded to in our College motto, that whereas it is stated that pneumonia is a common antecedent of ulcerative endocarditis, I have only myself met with this one instance of it.

The facts which stand salient with regard to infective endocarditis are the frequent concomitance of

previous valve defect and exposure to sewer-gas emanations or other sources of septic infection, and these factors will be found to underlie and initiate the whole pathology of the disease in the vast majority of instances. They are in my belief the objectives of our prophylactic and therapeutic treatment.

A due recognition of these facts will add to the care with which on sending a patient convalescent from rheumatic fever with endocarditis to a seaside or country resort we should satisfy ourselves as to the sanitary condition of the house to be occupied. For with as yet unprotected and imperfectly healed lesions exposed in the current of the blood, such a patient is very accessible to microbic infection.

Obviously the first inquiry in any case presenting symptoms suggesting infective endocarditis is into his sanitary surroundings and into every possible source of autogenetic infection, such as otitis, chronic gleet, pelvic abscess, and the like, and to at once deal with any such defect.

The next point which strikes the clinical observer is the fact that with a mild remittent fever there are associated more or less periodical outbreaks of high temperature with great fluctuations of from a few hours' to two or three days' duration.

These may be explained either by the toxic products of the microbe cultivation requiring sometime to accumulate before they produce their characteristic symptoms, or, and I am inclined to think more probably, by embolic fragments, detached colonies of

microbes causing sudden accessions to the dose of toxins, for it is a fact that most of the higher pyrexial excursions are attended with fresh embolic phenomena. In any case there are certain intervals between the stormy accessions during which remedies have a chance of influencing the disease.

A gentleman, a former member of our profession, recently remarked on a public occasion that apart from surgical measures the only function left to the healing art was of a prophylatic kind. I can only trust that when that gentleman's time shall come to be smitten with illness it will be of a kind accessible to surgery. He might, indeed, point in justification of his satire upon those who have to deal with the more occult phenomena of disease to the position which therapeutics stand with regard to infective endocarditis at the present moment.

We can often prevent this appalling malady; we may sometimes nip in the bud by prophylactic measures its dire development. What can we do in its treatment?

Of drugs arsenic is the only one under a course of which I have seen this disease get well. I do not remember to have seen any appreciable result from quinine, sulpho-carbolates, guaiacol, mercury, or other remedies of the antiperiodic or antiseptic class. But in the face of the dreadful mortality of at least 80 per cent. of the cases that prevails arsenical treatment must promptly be abandoned for any more promising remedy. And looking to the pathology of the disease

it would seem that in the modern development of serum therapeutics there is most to be hoped for in its future treatment.

It is hazardous to trust the reports of any new method of treatment until a sufficient time has elapsed for the favourable cases which have brought it into vogue to be duly apportioned to those in which it has failed. There have been recently reported four cases treated by the anti-streptococcus serum with the very encouraging result of three recoveries.

It must not be concluded, however, that this represents anything like a just account of the results of the treatment. A considerable and as yet unpublished experience at the various large hospitals and in private has already gone far to moderate enthusiasm for this method of treatment.

I have here a table of all the cases that have come within my personal knowledge through inquiry amongst my friends and at some of the principal London hospitals.

They are 14 in number, which include the 3 successful cases already published, 9 deaths, and 2 in which no favourable result has ensued.

We must allow for the fact that in some of these cases the anti-streptococcus serum has, from a natural hesitancy with regard to its efficiency and some timidity of possible risks in its employment, been only employed in later and almost hopeless stages of the disease when already large embolic detachments have set up centres of cultivation in many positions, so that the accom-

SERUM TREATMENT OF ULCERATIVE ENDOCARDITIS.

No.	Observer.	Sex.	Age.	Duration of illness before first injection.	Leading Symptoms.	Date of commencement of injections.	Dose.	Number of injections.	Result.
1	Dr. Harrington Sainsbury.	M.	13 years.	72 days.	Cough, streaks of blood, and clot sputum; temperature 104·4° F. Enlarged heart; double murmur at the apex; dulness at both bases + left. Streptococci in the blood; erythematous rash.	Aug. 17th, 1896.	20 c.c. first; 10 c.c. subsequently.	6	Recovery; normal temperature, Sept. 2nd, 1896.
2	Dr. A. E. W. Fox.	M.	36 years.	1 j days.	Muddy complexion and slight jaundice; temperature 104·6° F. Heart: first sound reduplicated, ending in slight whiff; soft systolic murmur in pulmonary and aortic areas; emboli in certain vessels.	Nov. 19th, 1896.	10 c.c. (10 c.c. twice a day, 23rd to 29th). Injections again Dec. 1st.	15	Died (Dec. 2nd 1896). Verified by post-mortem examination.
3	Dr Margaret Pearse.	F.	16 years.	48 days.	Dyspnœa and palpitation; temperature from 101 to 103° F. (once 105°); pulse 116; rheumatic pains in the shoulder. Heart enlarged; mitral systolic; double aortic; fluid in the pericardium (pericarditis) and right pleura. Spleen enlarged and tender.	Dec. 24th, 1896.	2½ to 20 c.c.	8	Recovery; normal temperature, Jan. 11th, 1897.
4	Dr. J. A. Washbourn.	F.	21 years.	61 days	Pale and thin; rigors; perspirations; pain in the joints; diastolic bruit left side of the sternum.	March 24th, 1897.	20 c.c. until last 2 weeks when gradually diminished.	60	Recovery; normal temperature, May 6th, 1897.
5	Dr. J. F. Goodhart.	M.	18 years	78 days.	Pale, anæmic; dyspnœa; giddy; faint; pain over the heart; temperature from 100 to 101° F., intermittent; old cardiac disease known to exist; systolic bruit all over precordia, but especially the aortic area; the spleen	Nov. 26th, 1897.	20 c.c. (4 times) 10 c.c. once.	5	Failure.

6	Dr. Percy Kidd.	F.	19 years.		Anæmia; remittent pyrexia; temperature from 103° to 99° F.; enlarged and tender spleen and liver; albuminuria; retinal hæmorrhages; petechiæ; hypertrophy and dilatation of the left ventricle; aortic stenosis; bronchitis.		5 to 25 c.c. 420 c.c. in all.	25	confirmed by post-mortem examination).
7	Dr. Percy Kidd.	F.	30 years.	About 3 months.	Rheumatoid pains; pyrexia moderate and of remittent type; tender enlargement of the spleen and liver. Heart: hypertrophy and dilatation of the right and left side; mitral stenosis and incompetence.	—	5 c.c. to 25 c.c.	9 in first five days; omitted for 2 months; then 3 or 4 more.	Death.
8	Dr. A. E. Sansom.	M.	39 years.	About 10 days (5 in hospital).	Irregular characteristic temperature; infarction of the spleen and kidney.	—	10 c.c. 6th and 7th days.	2	Death (confirmed by post-mortem examination).
9	Dr. J. F. Goodhart with Dr. C. Christopherson.	—	—	—	Very pronounced case with cerebral embolism.	—	10 c.c.	4	Failure.
10	Dr. Stephen Mackenzie.	M.	25 years.	15 weeks.	Pyæmic abscesses; temperature; rigors; systolic murmurs at the apex and base.	—	10 c.c.	21 in 11 days.	Died (confirmed by post-mortem examination).
11	Dr. W. P. Reynolds and Dr. J. Young with Dr. J. F. Goodhart.	M.	45 years.	85 days.	Wasting; profuse sweating; evening rise and morning fall of temperature; soft systolic bruit at the apex; pain in the cardiac region.	Dec. 14th, 1896.	10 c.c.	3	Died (verified by post-mortem examination).
12	Dr. M. Prickett with Sir Douglas Powell and Dr. Washbourn.	M.	—	145 days.	Irregular pyrexia extending over more than 5 months; progressive anæmia; endocardial murmur; repeated attacks of vomiting; dropsy towards final stages of illness.	Aug. 4th, 1897.	—	11	Died.
13	Dr. Curnow.	M.	43 years.	—	Irregular pyrexia, evening rise (104°), morning fall, double murmur all over precordia; liver enlarged; anasarca; ascites; albumin in urine; pneumonia; streptococci in blood.	March 16th, 1898.	10 c.c.	15	Died (verified by post-mortem examination; diplococci from heart).
14	Dr. J. N. Miller of Blackheath.	F.	—	About 56 days.	Irregular pyrexia, 105° F.; shivering; mitral systolic murmur; pulse rapid; cough; swelling and stiffness of right leg; delirium; coma.	May 26th, 1898.	6 to 15 c.c.	14	Died.

panying table need not be regarded as so discouraging as would at first appear.

It may be laid down as a principle governing treatment by this particular serum that the more distinct the history of a previous endocardial lesion and a subsequent exposure to infection through a suppurative medium or a sewer gas sepsis the more appropriate the case for the treatment. This rule would discourage its employment in cases in which the pneumococcus, gonococcus, or some other microbes divergent in character from the strepto- and staphylo-cocci were concerned, and if with the recognition of this principle and its earlier and bolder carrying out more encouraging results are obtained it will certainly follow that analogous measures will be found for the circumvention of the other forms of microbic action.

There is a further point in the natural history of infective endocarditis which is well illustrated in Chart I. —viz., that towards the close of the case when the vital powers are at a low ebb the temperature tends to fall apart from any treatment and the reactions to embolic incidents are much less marked or do not occur at all. It is possible that thus, if the serum be used late in the case, it may have effects attributed to it which should be otherwise accounted for.

I will venture now to allude to a case treated by the subcutaneous use of another material—viz., yeast—which, although it occurred four years ago and struck me very much at the time, it did not seem then advisable to publish, for as it stood it might perhaps

equally well illustrate the value of a treatment or the fallacy of drawing any deduction from a single case.

I had some months previously seen a case of infective endocarditis of long standing with Sir W. Broadbent in which he had for a time employed yeast given by the mouth with the apparent effect that during the several weeks of the treatment the temperature had preserved a lower although not a normal range; the patient, however, became nauseated and would not continue the remedy and finally died from the disease.

A young man, aged twenty-one years, with slight defect at the aortic valve, lived in a room over an archway which covered a former inlet of the Thames and presented a surface of stagnant Thames mud, sometimes dry, often wetted with surface water from the extended basement of an ancient building. He was given to violent exercises—bicycling, gymnastics, and engineering work—and the presumption is that he overstrained an old-standing valve lesion.

On May 15th, 1895, he dined out with a friend and was taken ill with vomiting and faintness in the train going home. He was seen by Dr. Davis, of Dorset Square, on the 16th, when he had a temperature of 102° F., general malaise, and a cardiac murmur of aortic regurgitant character. The temperature continued raised for four days, when I saw him in consultation with Dr. Davis.

The heart condition did not seem to account for the temperature and from the first some more general cause was suspected. There were no rheumatic sym-

ptoms nor were there any special symptoms of enteric fever. On about the eighth day he had a severe rigor and the temperature, which had been ranging between 102° and 100°, suddenly amounted to 105°, running down again to 100° in a few hours; after fluctuating at the original level for four or five days another rise to 105° would take place with a rigor as before. Sometimes a second rigor would closely follow the first with a corresponding acute rise of temperature. With the rigors there was sometimes sharp pain over the splenic region and the spleen was distinctly enlarged.

On June 1st he was removed to a perfectly sanitary nursing home, but the symptoms remained unaltered.

Salicylate of soda was at first administered and quinine was then given in 5 gr. doses without result and moderate doses of arsenic were tried, but these drugs did not influence the symptoms. The aortic regurgitant murmur became very marked and a curious, rough, somewhat churning, but mainly systolic murmur was heard over the left auricular region.

On July 1st injections of yeast culture were employed, from 20 to 30 minims of the yeast being injected into the cellular tissue each second day, and these were steadily continued until September 1st. Sir W. Broadbent joined us in consultation on July 14th, when the murmur was noted as most audible to the left of the sternum and as not affected by inspiration but prolonged during expiration. The deep cardiac dulness was increased both upwards and to the right. The systolic rough bruit was much more loud

and rough during high pyrexial periods. There were never any signs of renal emboli.

Soon after the commencement of the yeast treatment he had acute right pleurisy with some effusion. This began with two or three of the usual rigors in quick succession and uprisings of temperature, but the temperature remained high for a few days. With this interruption the intervals of four days between the rigors which had pretty steadily been observed appeared broken by the yeast injection and prolonged to six or seven days. The temperature became normal, or nearly so, in the intervals and altogether normal about August 14th, three months from the commencement of the illness with complete cessation of rigors.

The patient went to Brighton on Sept. 1st and rapidly convalesced and has remained active and well since.

In this case the yeast culture (a fairly concentrated cultivation of yeast in saccharine water) was obtained from Messrs. Burroughs and Wellcome. It was an inconvenient and unstable preparation, although it seemed to serve a very good purpose.

Dr. De Bacher of Paris seems to have originated the yeast ferment treatment of microbic diseases and it was from a reference (after my observation of Sir W. Broadbent's case) to his experiments* with "Backerin," an aseptic preparation of fermentable material containing the yeast fungus, that I was induced to use the yeast preparation subcutaneously.

* "Journal des Sciences Medicales de Lille," 1893, review of MM. De Bacher's and Bruchet's experiments by Professor Lemière.

"Backerin" could not be obtained at this time and I have not been able to procure it since. De Bacher* explained the efficiency of the yeast fungus in microbic diseases by the cells attracting into their interior and finally killing various microbes and thus helping the germicidal function of the white corpuscles.

I have used yeast subcutaneously in four other cases, in one of the four using it also in the form of dry yeast in 30 grain doses by the stomach, but I cannot say that any marked result followed. The cases, were, it is true, all rather advanced with splenic and other embolisms. One case was a sequel to gonorrhœa, one to suppurative otitis, and the other two of less defined source.

Dr. Vaughan,† Professor of Hygiene and Physiological Chemistry at Michigan in 1894, advocated the use of solutions of nuclein and nucleinic acid in the treatment of microbic diseases. Dr. Vaughan contrasts the toxin diseases with those in which the phenomena presented are due to more direct microbic action—in the one class there being an acute intoxication of the system by the action of microbes or ferments of very limited life duration, in the other a more continued life and virulence of the organism; and he regards the nucleins as possessing practically no influ-

* "Les Ferments Therapeutiques," Paris, 1896, p. 73 *et seq.*

† "The Nuclein and Nuclein Therapy," Transactions of the Michigan State Medical Society, *Medical News*, New York, Feb. 27th, 1897. "The Physiological Action and Therapeutic Uses of Yeast, Nucleinic Acid. With special references to its employment in Tuberculosis." V. C. Vaughan, M.D.

ence as antitoxins whilst being powerful indirect germicides.

From experiment he finds the subcutaneous injection of nuclein to increase the number of white corpuscles both in healthy and tuberculous persons, the increase being variable in degree from slight to threefold and principally of the polynuclear cells. This increase is most evident at the fifth hour and disappears after the forty-eighth hour. Dr. Vaughan* bases the assumed efficacy of his nuclein treatment of microbic disease upon the observations of Fodon, Nutall, Buchner, and others, showing that the germicidal properties of blood serum depend upon constituents yielded to it by the white, and especially the polynuclear white corpuscles, arguing that this natural resistance to bacterial disease will be strengthened by a physiological increase of these corpuscles induced by the introduction of the most distinctive constituent of these cells—viz., nuclein.

The dose of the nuclein for subcutaneous use is 20 minims and upwards of a one per cent. solution or a teaspoonful of a five per cent. solution taken by the mouth between meal-times. It is needless to say that the strictest antiseptic cleanliness with regard to syringes and preparation of the skin surfaces is absolutely necessary in the subcutaneous use of the preparations.

I do not for a moment claim to express any opinion as to how far this treatment may prove useful in infective endocarditis. I am not aware that it has been tried

* *Loc. cit.*

except in the treatment of tuberculosis, although it has been advocated both in the form of the original preparations of Dr. De Bacher and as nuclein solutions in the treatment of all microbic affections. It has occurred to me that nuclein derived from the young yeast cells may have been the material responsible for the apparent usefulness of yeast in Sir W. Broadbent's and my cases and that it may be worthy of trial in cases at all events in which anti-streptococcus serum would not be applicable.

The only case of infective endocarditis in which I have used nuclein is one seen by me in consultation with Mr. Christopherson of Hastings, of which I have here a chart (Chart II.) with sufficient marginal notes for the identification of the case. The effect appears very striking the temperature falling to the normal, but after an interval of eighteen days it again rises with what appears to be an embolic incident. With regard to this case, which was treated by nuclein with apparently a marked although a temporary result, it should be recorded that Mr. Christopherson, with whom I on two occasions saw the case, has sent me a further note and a chart carefully recorded since the nuclein was first administered. The boy has had many relapses and although he has gradually improved, it cannot fairly be said that any appreciable effect upon the temperature has again been observed from the nuclein.

I regret that time has not allowed me to allude more fully to some forms of cardiac disease, more especially to the subject of senile and prematurely degenerative

CHART II.

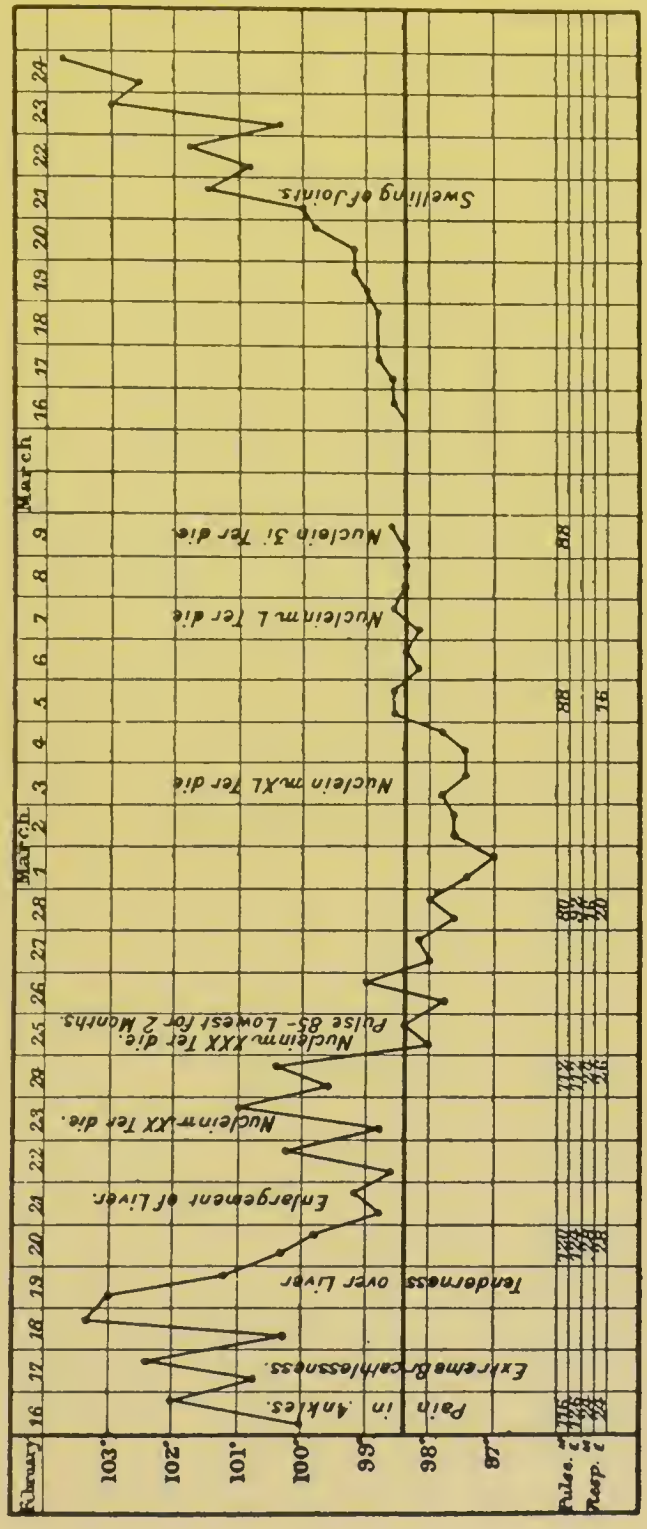


Chart illustrating the temperature of a case of ulcerative endocarditis treated by nuclein. (Under the care of Sir Richard Douglas Powell and Mr. Cecil Christopherson).

diseases of the heart. A reference to them must have been somewhat discursive, for whilst they admit of much management they necessarily allow of little direct treatment. And, indeed, in trying to seek out points for treatment which are scattered here and there amidst groups of symptoms I fear I have already been too discursive.

My endeavour has been to illustrate the principles of treatment rather than to touch upon details, the recognition of the neuropathic state, the principle of rest, of exercise, of drug administration, of restrictions in diet upon which we formulate our more percise management of individual cases. Finally, by a due acceptance in cardiac therapeutics of the principle of submission we may better help the patient to acquiesce in his restricted life, caged within the narrowed conditions under which alone it can be maintained and continue useful.

Chart I.

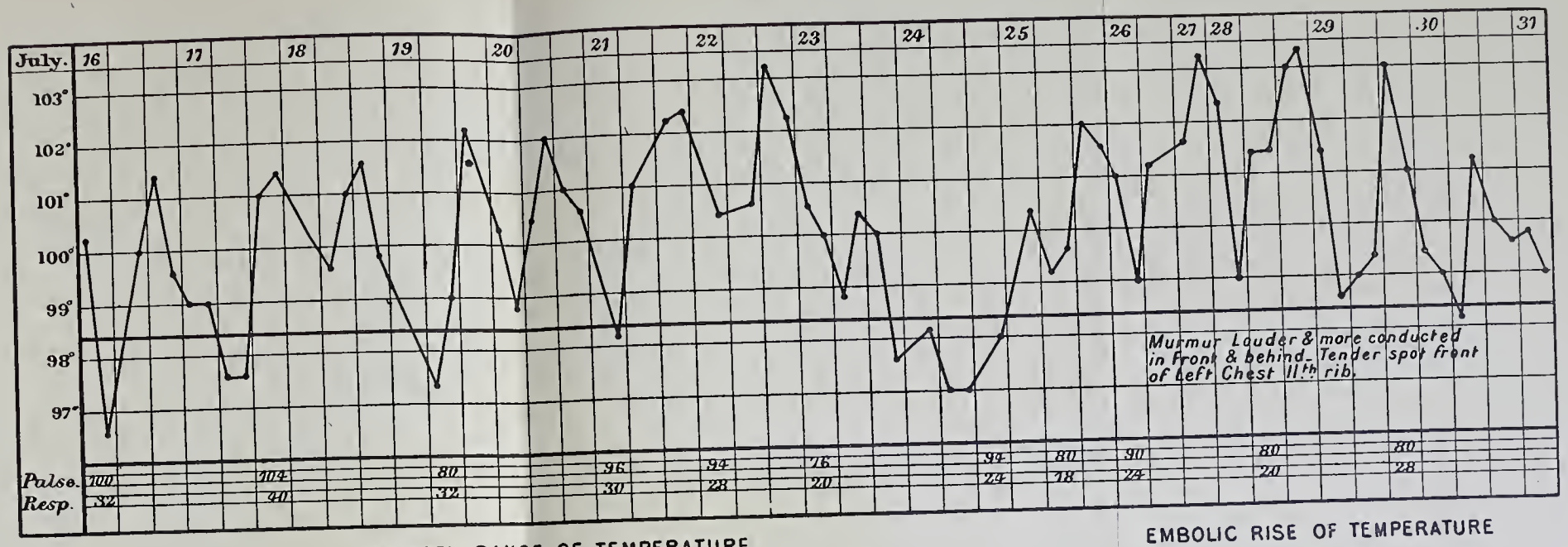
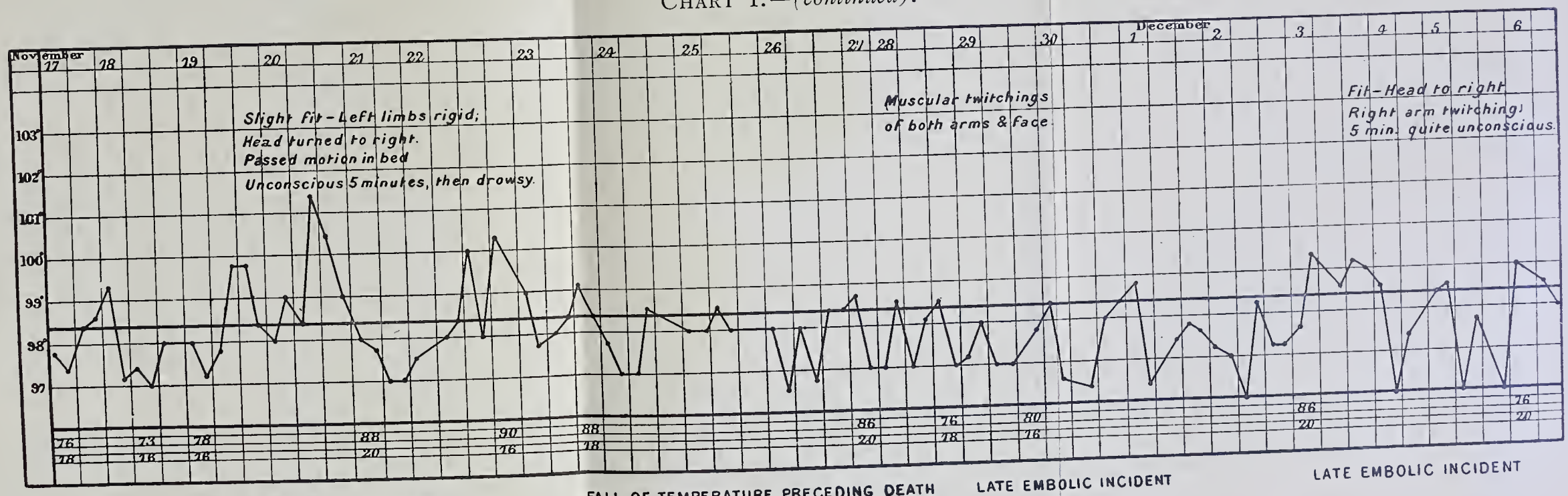


Chart illustrating the temperature of a case of ulcerative endocarditis. Between the dates July 26th and July 30th is a well-marked embolic rise of temperature.

Chart I.—*(continued).*



It will be noticed that after the fall of the temperature preceding death reactions to embolic incidents hardly occurred.

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